

***BANNED IN  
BEIJING!***

**DID LIN ZEXU  
MAKE MORPHINE?**

**VOLUMES I / II**

---

**G. W. Robinette**







Arranged in two volumes



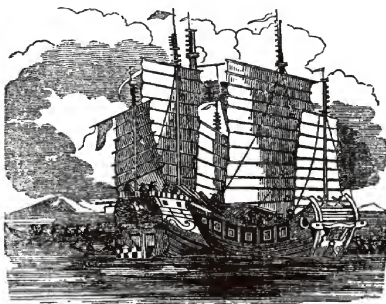


Commissioner Lin Zexu

# DID LIN ZEXU MAKE MORPHINE? Volume One

---

G. W. Robinette



GRAFFITI MILITANTE PRESS  
*Valparaiso, Chile*  
2008

*First Hardcover Edition*  
*Graffiti Militante Press*  
*Valparaiso, Chile*  
*Copyright 2008 by Graffiti Militante Press*  
*All rights reserved*

ISBN 978-0-9820787-2-3

*There are said to be three stages to considering something even slightly controversial: that's ridiculous, forget about it, and I knew that. Hopefully, this small footnote of revisionist history is worthy of all three.*

*This one is for Antonio.*



## Acknowledgments

---

*No book can be constructed alone. Thanks are gratefully expressed to Ms. Li Juan Wang, Mr. Chen Song, Ms. Qingrong Wei and others for checking the translations from the Chinese against the CBYWSM (TK) online and the original archived at the Harvard Yenching Library, to Professors John Y. Wong of the University of Sydney, Australia and Frank Dikötter of Hong Kong University for their helpful critiques and healthy skepticism, and of course to Sasha. No endorsement of any hypothesis expressed in this work is in any way implied or intended. All errors are mine.*



## PREFACE

---

GOOD evidence suggests that Commissioner Lin Zexu may not have destroyed the foreign opium in June of 1839 and may even have been able to extract from it a type of morphine base.

In March 1839 Lin Zexu arrives in Canton, sent by the emperor to halt the export of silver from and the import of opium into China. He demands the foreign traders surrender their opium, threatens to burn it and holds them hostage for a month and a half until it is received. But Lin does not *burn* the foreign opium once it is in his possession. He does not send it overland or by sea to the emperor in Peking. He does not dump it in the ocean. He does not bury it. He does not load it aboard a war-junk and set fire to it.

He *does* soak it in water, lime and salt. Historians who consider this event seem to be very sure of two things: one, that this was the best method of destroying opium though it had never before been tried and two, that lime and salt and water actually destroy opium. Lime and salt were common ingredients in 19th century European recipes for extracting morphine from opium. Lime and a salt (ammonium chloride, not sodium chloride) are still used to extract morphine from opium in field laboratories in Southeast Asia. It is admittedly a small point but the curious similarities beg the obvious next question: Could Lin have made morphine?

Lin Zexu's confiscation of the opium from the barbarians was merely the *casus belli* for the so-called Opium War (1839-1842), an event thoroughly predicted by many in the 1830s. Nevertheless, his "destruction" of the foreign opium remains the signature moment in what is considered by many to be the introduction of China into the modern era. The most popular story is that Western drug dealers unscrupulously addicted China to an unmitigated evil, opium; Lin Zexu then heroically defended both the nation and the people by seizing and destroying it.

Unfortunately, this simplistic rendering overlooks a significant moment in the history of modern chemistry, sometimes known as



## PREFACE

the Age of the Alkaloids (1820-1840). While the Commissioner was soaking his opium with salt, lime and water in Canton, pharmacists and chemists were extracting the "active principles" from plants with the same ingredients in their laboratories in Berlin, Paris and Edinburgh. Indeed, so many different alkaloids such as morphine, quinine and caffeine were extracted from such a variety of plants with such simple ingredients and techniques that many chemists now consider this period to be the foundation of modern organic chemistry. Further, there is much evidence that these methods and results were not unknown among the foreigners trading at Canton and were probably understood by their contemporary Chinese chemists as well. Finally, opium, morphine and other opium alkaloids formed the basis for many so-called cures for the opium habit widely sold in Guangdong province with the approval of Lin Zexu during his brief tenure there.

Taken together, these pieces of evidence may provide a more rational and dispassionate perspective on the mandarin Lin Zexu, the First Opium War, the Chinese sense of shame and grievance at her modern history, and the failure of the First World War on Drugs.

G. W. R.

# CONTENTS

## Volume I

---

### PART ONE - MYTHS AND LEGENDS

I.	OPIUM TALES	11
	Lin as hero and symbol. Five legends: the burning, drowning, sailing away, burying and plastering tales.	
II.	THE BURNING TALE	21
	Origins. The emperor's new closer. Lin's first edict to the foreigners. The initial foreign response and previous experience. The official version of events: Lin's 1838 memorials, first and second letters to the queen, April 1839 memorial to the emperor, and reports afterwards.	
III.	THE DROWNING TALE	45
	Origins. First and second letters to the queen. Lin's 1838 memorials to the emperor. Address to the sea spirit. Proclamation. First edict to the foreigners.	
IV.	THE SAILING AWAY TALE	51
	Origins. British Chamber of Commerce response. Previous Chinese communications. Contradictory evidence.	
V.	THE BURYING AND PLASTERING TALES	57
	Origins. Lin's proclamation.	

## CONTENTS – Volume One

### PART TWO - HISTORY

VI.	THE SALT, LIME AND WATER TALE	61
	20th and 21st century second hand accounts. 19th century second hand accounts. Reports by three sinologists: Tan Chung, Arthur Waley, and Hsin-pao Chang.	
VII.	OFFICIAL ORIGINS OF THE SLW TALE	73
	The old method of fire and wutung oil: old method not mentioned and old method described. The new method of salt, lime and water: neither method mentioned in communications to the foreigners or to the Chinese and the new method described. The emperor's instructions. The reason given for the change of method.	
VIII.	CONTEXT FOR THE EYEWITNESS ORIGINS	99
	The open jobsite hypothesis. The emperor's edict. The interpretations and observations of Bridgman. The interpretation and opinions of King. The interpretation of Lin. Lin's memorials to the emperor.	
IX.	EYEWITNESS ORIGINS	111
	King's account. Bridgman's account. Lin's account.	
X.	COMMONALITIES AND FAULTS	123
	Common to the eyewitnesses: personal and professional prejudice. Common to the eyewitness accounts: who, when, where, what, how and why. Faults in the record: what the foreigners didn't see and the grand half-hour barbarian inspection tour.	

## CONTENTS – Volume One

XI.	CONTRADICTIONS	131
	Who. When. Where: the delivery, storage, preparation, processing and sources. What: the arrival of the barbarians, the tanks, the vantage point, the sluice(s), the screen(s), the departure of the barbarians. How: the ingredients, the method, the result including the smell, the separation and the quantity. Why.	
APPENDICES		
A.	SILVER, SALT AND OPIUM	171
	Silver. Salt. Domestic opium prohibited. Solution observed and abandoned.	
B.	<i>PAPAVER SOMNIFERUM L.</i>	185
	History: languages, archaeology, and literature. Description. Geography: 20th/21st century commercial production and 19th century commercial production. Cultivation: climate and soil, field selection and land clearing, land preparation and cultivation methods. Simple plant extractions. The juice of <i>P. somniferum</i> , opium: description and history, including language, archaeology, and literature both in the West and in China: harvesting; and processing opium for the China market including drying and packing. The Poppy Straw method: description and history, harvesting, processing and alkaloid extraction.	

## CONTENTS – Volume One

C.	DOCUMENTS	231
	Lin's first, second and third memorials to the emperor from 1838. The original and translations by Shuck and Morrison of Lin's first edict to the foreigners. Lin's first letter to the queen of England. Lin's first memorial from Zhenkou. King's account. Bridgman's report. Lin's second memorial from Zhenkou. The original and two translations of Lin's second letter to the queen.	

DID LIN ZEXU  
MAKE MORPHINE?  
Volume I

---

## ILLUSTRATIONS in volume one

1. Destroying the Opium Front Cover  
Source: [http://en.wikipedia.org/Image: Destroy\\_opium\\_2.jpg](http://en.wikipedia.org/Image:Destroy_opium_2.jpg),  
[www.spph.com.cn/images/tupian/040720\\_hmxy.jpg](http://www.spph.com.cn/images/tupian/040720_hmxy.jpg).
2. Commissioner Lin Zexu Frontispiece  
Source: [http://en.wikipedia.org/wiki/Image: Lin\\_Zexu\\_1.jpg](http://en.wikipedia.org/wiki/Image:Lin_Zexu_1.jpg),  
[http://www.chinapenet.org/News/news\\_detail.asp?id=647](http://www.chinapenet.org/News/news_detail.asp?id=647).  
Author: "Most likely Lamqua (active 1830-1860) or Tinqu (active 1840-1860)."
3. The War Junks of the Ladrões Title Page  
Source: The Pirates Own Book: Authentic Narratives of the Most Celebrated Sea Robbers, by Charles Ellms, original from 1837, [www.gutenberg.org/files/12216/12212-h/12216-h.htm](http://www.gutenberg.org/files/12216/12212-h/12216-h.htm).
4. Qing Officials Burning Opium 9  
Source: [www.grtc.org/articles/martialcivil.html](http://www.grtc.org/articles/martialcivil.html).
5. Memorials to Lin Zexu montage 10  
Sources: (lower background) "Photo Gallery in the Monument to the People's Heroes: Burning Opium in the Opium War in 1840," [http://puzhi.vicp.net/pz\\_asianfd/China\\_Beijing\\_the%20Monument%20to%20the%20People's%20Heroes\\_Photo%20Gallery\\_a209\\_s10\\_c212.html](http://puzhi.vicp.net/pz_asianfd/China_Beijing_the%20Monument%20to%20the%20People's%20Heroes_Photo%20Gallery_a209_s10_c212.html); (center, inset) Pink Statue at Zhenkou, [www.panoramio.com/photo/7111959](http://www.panoramio.com/photo/7111959); (left upper) Monument to the People's Heroes, [www.flickr.com/photos/saad/2279202/in/set-57223](http://www.flickr.com/photos/saad/2279202/in/set-57223), author: Saad Akhtar; (right upper) Chatham Square statue, 6 May 2006, [www.flickr.com/photos/63091016@N00/141479442](http://www.flickr.com/photos/63091016@N00/141479442), author: C. Weiner Campbell, all rights reserved.
6. Map of the Pearl River Delta 59  
Source: "*Situationskarten von Karten Macao Hongkong*.jpg, from the 4th edition of Meyers *Konversationslexikon* (1885-1890), [http://commons.wikimedia.org/wiki/Atlas\\_of\\_Macau](http://commons.wikimedia.org/wiki/Atlas_of_Macau).  
Map of China from Rand McNally  
Source: The New Student's Reference Work for Teachers, Students and Families. Editor: Chandler B. Beach. 5 vols. Chicago: F. E. Compton and Company, 1914, found at <http://en.wikipedia.org/wiki/Image:LA2-NSRW-1-0148.jpg>.
7. The Bocca Tigris, Three Mouths, Pools at Zhenkou 60  
Source: [//wikimapia.org/#lat=22.7755484&lon=113.6501312&z=11&l=0&m=a&v=1](http://wikimapia.org/#lat=22.7755484&lon=113.6501312&z=11&l=0&m=a&v=1). Satellite images copyright Google Maps 2006.
8. Papaver somniferum L. 169  
Source: A Manual of Materia Medica and Pharmacology, by David M. Culbreth, published by Lea and Febiger, 1927, from [www.swsbn.com/Illustrations/Papaver.gif](http://www.swsbn.com/Illustrations/Papaver.gif).

## PART ONE MYTHS AND LEGENDS

---

*QUERIDO* Antonio, as you know many myths and legends have grown up around what took place in Canton, China during the first half of 1839. Specifically, what the Commissioner did or did not do with the confiscated foreign opium has been reported and misreported repeatedly, leading to widespread and popular confusion even in some otherwise thoroughly researched and well respected work. To paraphrase Lin Zexu, only by examining these stories for what is certainly false and why, is it possible to begin to draw some boundaries around what might be true.



Qing Officials Burning Opium





Top Left: Monument to the People's Heroes, Beijing  
 Top Right: Statue of Lin Zexu, Chatham Square, New York City  
 Bottom: Burning the Opium, Monument to the People's Heroes  
 Inset: Statue, Opium War Museum, Zhenkou

# I

## OPIUM TALES

---

- I. OPIUM TALES
  - A. HERO
  - B. SYMBOL
  - C. LEGENDS
    - 1. THE BURNING TALE
    - 2. THE DROWNING TALE
    - 3. THE SAILING AWAY TALE
    - 4. THE BURYING TALE
    - 5. THE PLASTERING TALE
  - D. DISCUSSION

NATURALLY, there are more stories of what did *not* happen than of what did. Most of them come wrapped up together and are admittedly contradictory. To try to bring some order to this confusion, it may be useful to briefly review Lin's near cult status as hero and symbol and then list some examples of the legends that surround the event.

### A. HERO

Lin is a national hero in China. Even though it wasn't, in Beijing "The Burning of the Opium" is literally carved in stone. A two-meter high bas-relief depicting "the incident on June 3, 1839, in which chests of opium were destroyed by an angry crowd" is chiselled in marble on the eastern face of the plinth of the tallest (38 meters) obelisk in China, the Monument to the People's Heroes, in the center of Tiananmen Square.<sup>1</sup>

---

<sup>1</sup> Ubiquitous. Found at [www.china.org.cn](http://www.china.org.cn), [www.newsgd.com](http://www.newsgd.com), [www.beijingguide.com](http://www.beijingguide.com), <http://gimbo.org.uk>, and [www.chinapages.com](http://www.chinapages.com).

Neither Lin nor an angry crowd burned the opium, of course, nor did three million pounds of foreign opium disappear in a single day. Beijing's stone carving only celebrates the anniversary of Lin's starting date. The sinologist Arthur Waley records: "On June 3rd the destruction of the opium began ...."<sup>2</sup> The missionary-publisher E. C. Bridgman printed Lin's proclamation declaring "the 22nd day of the month (June 3d)" to commence the process he referred to as his 'transmutation' of the opium.<sup>3</sup>

Nor is Lin's fame confined to the Chinese capital. Near Hong Kong, the Dongguan Opium War Museum admits tour groups who can bow their heads in respect inside the Lin Zexu Memorial Hall, admire the Lord Lin Zexu Statue, and marvel at the recently excavated "opium burning pool."<sup>4</sup>

Lin's confiscation of the foreign opium conveniently provided a *casus belli* for the First Opium War (1839-1842). The Manchu dynasty lost; Britain seized and held Hong Kong for a century and a half. Included in the Chinese delegation who presented the 1984 Joint Declaration to the United Nations committing Britain to return the island was none other than Lin's great, great grandson, Ling Qing, a retired diplomat.<sup>5</sup> The assumption of Chinese sovereignty over the island in 1997 was even hailed as "the revenge of Commissioner Lin."<sup>6</sup> The return of the territory also marked the release of "China's first blockbuster," a fifteen million dollar "nationalist epic," the "most expensive production in the history of

---

<sup>2</sup> Waley, Arthur. *The Opium War Through Chinese Eyes*. Stanford, CA: Stanford University Press, 1968, p. 47.

<sup>3</sup> Bridgman, E. C. "No. 43." *The Chinese Repository*, volume 8, May 1839 to April 1840. Canton: Bridgman, 1840, p. 36 ([www.macaodata.com](http://www.macaodata.com), hereafter simply MD): "There stone trenches will be opened; and lime and salt will be taken and mixed with the opium, until the drug is completely transmuted and destroyed."

<sup>4</sup> Found at [www.newsgd.com](http://www.newsgd.com), [www.dongguan-hotels.com](http://www.dongguan-hotels.com), and [www.phy.cuhk.edu.hk](http://www.phy.cuhk.edu.hk).

<sup>5</sup> Micklebaugh, Rod. "Chinese urged to 'wash away shame' in Hong Kong," *Milwaukee Journal Sentinel*, 12 June 1997 found at <http://findarticles.com>.

<sup>6</sup> Micklebaugh, Rod. "Chinese urged to 'wash away shame' in Hong Kong," *Milwaukee Journal Sentinel*, 12 June 1997 found at <http://findarticles.com>.

Chinese cinema," entitled *Ya-p'ien chan-cheng* or, in English, *The Opium War*. In the climactic scene, the actor Pao Guoan who plays the incorruptible commissioner "sets fire" to the opium.<sup>7</sup> With all of this, it would be surprising if many Chinese did not know Lin simply as "the man who burned the opium."<sup>8</sup>

His fame has followed the Chinese diaspora. A much larger-than-life statue in Chatham Square marks the entrance to New York City's Chinatown. The inscription on the base reads, "Lin Zexu (1785-1850): Pioneer in the fight against drugs."<sup>9</sup> Noleen M. (let's assume that's the name), who downloaded an excellent photo of the statue during a tour of the city, adds "his insistence on burning opium found on twenty-two British ships resulted in the Opium War."<sup>10</sup>

Lin has even become an international hero. While the Chinese celebrate the anniversary of the date Lin began, the United Nations honors the anniversary of the date he finished. "In recognition of his efforts, the United Nations declared June 26th – the anniversary of the opium destruction – as International Anti-Narcotics Day," reads one tourist oriented website.<sup>11</sup> But another, government sponsored website disagrees as to the motivation: "This date (26 June) was chosen, as it happened to be the date when the idea was suggested in the conference."<sup>12</sup> The internet will not be the only source of misinformation about this event.

Once again, there is some correlation with dates. In 1987 the United Nations General Assembly did resolve "to observe 26 June as

<sup>7</sup> Gee, Alison Dakota. "Xie's Epic Victory," at [www.asiaweek.com](http://www.asiaweek.com); Foronoff, Paul. *Variety*, 23 June 1997, found at [www.highbeam.com](http://www.highbeam.com).

<sup>8</sup> Zhongguo Fu Li Hui. "The Man Who Burned the Opium," *China Today*, 1990, pp. 28-29 (GoogleBooks, hereafter simply GB).

<sup>9</sup> Lin Tse-hsü (Pinyin romanization Lin Ze-xu) was born in Hou-kuan, Fujian province, 30 Aug 1785 and died in Ch'ao-chou, Kwangtung province on 22 Nov 1850 according to *The New Encyclopedia Britannica*. Vol. 6. Micropaedia. 15th edition. Chicago: E. B. Inc., 1998, p. 246.

<sup>10</sup> Noleenm, 10 Nov 2006, <http://ireland-stories.ie>. See also [www.aviewoncities.com](http://www.aviewoncities.com) and [www.easynewyorkcity.com](http://www.easynewyorkcity.com).

<sup>11</sup> Found at [www.explorechinatown.com](http://www.explorechinatown.com).

<sup>12</sup> Found at [www.anti-narcotics.psd.gov.jo](http://www.anti-narcotics.psd.gov.jo).

the International Day against Drug Abuse and Illicit Trafficking."<sup>13</sup> The Harvard scholar and historian Dr. Hsin-pao Chang observes that on 25 June 1839, "a letter was received from the agent of Lloyd's" in Macao, stating, "The last of the opium is to be destroyed this day."<sup>14</sup> Commissioner Lin wrote a letter to the emperor after the fact, stating that all of the opium was "destroyed by the fifteenth day of the fifth month (June 25, 1839)."<sup>15</sup> The close fit of the day and the month suggests more than a coincidence.

## B. SYMBOL

Lin is a recognizable hero but the symbolism attached to the event itself certainly varies. The incident at Canton more than 150 years ago is and was deeply symbolic to many different people but for many different reasons. For late 20th century Chinese historians, the "destruction of the opium at Humen was a victory for China's anti-opium policy, showing the whole world the Chinese people's determination to stamp out trade in the poisonous drug and oppose foreign aggression."<sup>16</sup> On 3 June 1997, a month before the changeover of Hong Kong from British to Chinese sovereignty, "thousands of schoolchildren chanting anti-drug slogans marched through the streets of Humen" to celebrate the anniversary of "the first great victory ever won by the Chinese people."<sup>17</sup> One careful, modern Chinese-Indian scholar, not normally given to easy exaggeration, agrees that no matter the method, even so it was "the greatest act in the whole history of British and Chinese intercourse,

---

<sup>13</sup> Found at [www.un.org/NewLinks/drugs](http://www.un.org/NewLinks/drugs), specifically Resolution 42/112 adopted 7 Dec 1987.

<sup>14</sup> Chang, Hsin-pao. Commissioner Lin and the Opium War. Cambridge, MA: Harvard University Press, 1964, p. 175.

<sup>15</sup> Kuo, P. C. A Critical Study of the First Anglo-Chinese War with Documents. Taipei: Ch'eng Wen Publishing Co., 1970 (a reprint of the 1935 edition published in Shanghai), p. 250.

<sup>16</sup> Compilation Group for the History of Modern China. The Opium War. Peking: Foreign Language Press, 1976, p. 29, for example.

<sup>17</sup> Micklebaugh, Rod. "Chinese urged to 'wash away shame' in Hong Kong," *Milwaukee Journal Sentinel*, 12 June 1997 found at <http://findarticles.com>.

an act worthy of record in the same page with Britain's payment of twenty millions for the extinction of slavery."<sup>18</sup> Frank Dikötter, Lars Laamann and Zhou Xun state the drug enslavement argument succinctly:

China is "Patient Zero" in what is represented as a drug plague that has contaminated the rest of the globe; it is the single most important example in history of a culture commonly claimed to have been "destroyed" by an intoxicant other than alcohol.<sup>19</sup>

In the 19th century, Elijah C. Bridgman, eyewitness to the scene, solemnly declared it meant unexpected Oriental honesty, ability and devotion to duty: "The degree of care and fidelity, with which the whole work was conducted, far exceeded our expectations, and I cannot conceive how any business could be more faithfully executed."<sup>20</sup> A second Western eyewitness, the militantly anti-opium merchant Charles W. King saw in it the eternal conflict between pagan East and degenerate West: "While Christian Governments were growing and farming this deleterious drug, this Pagan monarch should nobly disdain to enrich his treasury in a sale which could not fall short of Rs. 20,000,000."<sup>21</sup>

### C. LEGENDS

Histories, gudebooks, and websites continue to repeat fanciful but deeply compelling tales of what did not happen. The confusion in the 21st century over what Commissioner Lin actually did or did not do with the confiscated foreign opium simply echoes the

---

<sup>18</sup> Chung, Tan. China and the Brave New World: A Study of the Origins of the Opium War (1840-1842). Durham, NC: Carolina Academic Press, 1978, p. 200.

<sup>19</sup> Dikötter, Frank et al. Narcotic Culture: A History of Drugs in China. Chicago, IL: University of Chicago Press, 2004, p. 2.

<sup>20</sup> Bridgman, E. C. "Destruction of the Opium at Chuenhow (Chinkow)." *The Chinese Repository* (hereafter *CR*), volume 8, May 1839 to April 1840. Canton: Bridgman, 1840, p. 74, (MD).

<sup>21</sup> Beeching, Jack. Chinese Opium Wars. London: Hutchinson, 1975, p. 85.

confusion in the 19th. The legends are often intertwined with one another. Most are accepted uncritically. A short list and some examples follow.

## 1. THE BURNING TALE

The most popular tale is that he burned the opium (italics added):

"...which Lin *burned* in public;"<sup>22</sup>

"In 1839 he prohibited the opium trade and *burned* the chests of opium found in British possession;"<sup>23</sup>

"... in a highly symbolic act of purification, 20,000 chests of imported opium were *burnt* in public;"<sup>24</sup>

"In June 1839, the official sent to end opium importation, Lin Zexu, *burned* twenty thousand chests of it on the beach near Canton;"<sup>25</sup>

"...Commissioner Lin vigorously suppressed opium in China. His seizure and *burning* of Indian opium, as we know, led to the Opium War;"<sup>26</sup>

"The opium was publicly *burned* in Humen by order of Lin Zexu;"<sup>27</sup>

"... more than 20,000 chests filled with opium, which were *burned* publicly in Humen ...;"<sup>28</sup> and

<sup>22</sup> Lin, Henry C. K. "China: A Case of Self-Delusion," 14 May 2003, [www.atimes.com](http://www.atimes.com).

<sup>23</sup> Eberhard, Wolfram. *A History of China*. London: Routledge, 2005, p. 438 (GB).

<sup>24</sup> Dikötter, Frank with Lars Laamann and Zhou Xun. *Narcotic Culture: A History of Drugs in China*. Chicago, IL: University of Chicago Press, 2004, p. 45.

<sup>25</sup> Kramer, Ione. *All the Tea in China*. San Francisco, CA: China Books, 1990, p. 26 (GB).

<sup>26</sup> Wong, J. Y. *Deadly Dreams: Opium, Imperialism and the Arrow War*. Cambridge, England: Cambridge University Press, 1998, p. 401 (GB).

<sup>27</sup> *La Historia, Colección China*. Beijing: *Ediciones en Lenguas Extranjeras*, 1984, p.103. Originally, *El día 3 de junio del mismo año, ese opio fue quemado públicamente en Humen por order de Lin Zexu*.

"The foreign merchants finally gave in and handed over more than 20,000 chests of opium to Lin, who, to the great dismay of the drug dealers, promptly *burned it*."<sup>29</sup>

One author likens it to a Midsummer Eve bonfire (italics added): "The commissioner made a *nighttime* ceremony of *burning* every one of the chests of opium and demanded the British get off Chinese territory."<sup>30</sup>

Another wisely keeps some distance (italics added): "(T)he first bas-relief depicts the 'Burning of the Opium' on June 3, 1839 when Chinese in the southern port of Humen rose up and *burned* chests of opium imported by foreigners. Some creative license has been applied to this event."<sup>31</sup>

## 2. THE DROWNING TALE

The second most popular story is that he threw it into the ocean (italics added):

"In 1839, as a consequence of a decision taken by the Chinese government to arrest the English superintendent Elliot and *sink into the sea*, in the bay of Canton, a ship loaded with 20,000 chests of 'chandoo,' with a value of 62 million *francs*, the famous Opium War was provoked with Great Britain ...."<sup>32</sup>

---

<sup>28</sup> Shouyi, Bai, editor-in-chief. *Breve Historia de China: Desde la antigüedad hasta 1919*. Beijing: *Ediciones en Lenguas Extranjeras*, 1984, p. 413. Originally, ... *más de 20.000 cajas repletas de opio, las que fueron quemadas públicamente en Humen, a partir del 3 de junio, bajo las órdenes de Lin Zexu.*

<sup>29</sup> *The Republic of China Yearbook 1999*. Taiwan: Republic of China Government Information Office, 1999, p. 55.

<sup>30</sup> Hershenson, Bruce. *Hong Kong at the Handover*. Lanham, MD: Lexington Books, 1999, p. 2 (GB).

<sup>31</sup> Aldrich, M. A. *The Search for a Vanishing Beijing*. Hong Kong: Hong Kong University Press, 2006, p. 67 (GB).

<sup>32</sup> De Pagador, Y. A. *Pueblos, Razas y Venenos*. Santiago, Chile: *Ediciones Ercilla*, 1936, p. 37. Originally, *En 1839, a consecuencia de una decisión tomada por el gobierno chino, arrestando al intendente inglés Elliot y hundiendo en el mar, en la bahía de Cantón, un barco cargado de 20.000 cajas de 'chandoo,' de un valor de 62 millones de francos, se provocó por Gran Bretaña la famosa guerra del opio ....*



One version of this story has him both burning and drowning the opium simultaneously (*italics added*): "... he ordered his men to *burn* all the opium and *throw it into the sea*."<sup>33</sup> Another says he did both consecutively (*italics added*): "He *burned* the opium in a public demonstration and *scattered the ashes across the sea*."<sup>34</sup>

### 3. THE SAILING AWAY TALE

At least one popular account suggests that Lin wanted the British opium ships to simply sail away, writing that the senior Cohong merchant whom the British knew as Howqua (Wu Bingjian)<sup>35</sup> personally delivered a warning to the foreign merchants that if (*italics added*) "the opium fleet *did not sail away* or alternately give up its opium to be destroyed by burning, the legitimate trade would be closed indefinitely."<sup>36</sup>

### 4. THE BURYING TALE

A fourth version of the story tells that the opium was neither burned nor drowned, but buried (*italics added*):

"Lin caused large pits to be dug, and the opium, covered with *quick-lime*, was *buried* in the island of Lin-tin, in the presence of witnesses, after which operation, the foreign merchants detained at Canton were set at liberty;"<sup>37</sup> and,

"(T)he flowery sons of Han began *digging the grave* of 2,500,000 (British sterling pounds) worth of British government property on

---

<sup>33</sup> Choy, Lee Khoon, former ambassador to Singapore. "Understanding the Inscrutable Chinese," found at [www.easternstudies.com](http://www.easternstudies.com).

<sup>34</sup> Found at <http://historyliterature.homestead.com>.

<sup>35</sup> Hunt, Janin. *The India-China Trade in the 19th Century*. Jefferson, NC: McFarland, 1999, p. 63 (GB).

<sup>36</sup> Fay, Peter Ward. *The Opium War (1840-1842)*. Chapel Hill, NC: University of North Carolina Press, 1975, p. 160.

<sup>37</sup> Callery, M. M. et al. *History of the Insurrection in China* (trans. J. Oxenford). New York: Paragon Books Reprint Corporation, 1969, p. 17, from the "unaltered and unabridged" version of 1853 (GB).

the 4th of June. The very stones by and by will 'prate of it's (sic) whereabouts."<sup>38</sup>

## 5. THE PLASTERING TALE

Finally, one zealous, anti-imperialist Chinese historian, faced with the challenge between facts on the ground and nationalist pride, writes that Lin bought it, burned it, drowned it and plastered it (*italics added*): "After that, Lin Zexu reimbursed the foreign merchants with five Chinese '*jiu*' (grams) of tea for each chest *burnt* .... Lin had two ponds dug, poured salt into the water, *mixed up the water with plaster*, dumped the opium into the ponds, opened the ditch to the sea and scattered the opium ashes to the sea."<sup>39</sup>

## D. DISCUSSION

National hero, tourist draw and movie idol, Lin Zexu is completely and utterly famous in the 21st century for what he did not do. Lin is at once a poster boy in the fight against drugs *and* foreign aggression as well as a symbol of courage, Eastern idealism and unimpeachable honesty. There is as much confusion surrounding the event in newspapers, films, magazines and websites as there is in some of the better researched histories.

Beyond the exact details of what did or did not occur, the various tales about Lin and the opium now have lives of their own. Unfortunately, the previously cited stories are inaccurate on the following points: Lin did not burn the opium, not publicly, not on the beach, and not at night. Nor did the Chinese people "rise up." Lin did not sink it or throw it into the sea. He did not scatter the ashes of it into the sea because he did not burn it in the first place. He did not demand the opium ships simply sail away. He did not reimburse the merchants, nor bury it nor mix it up with plaster. He could have done any of these things but he didn't. There is much

---

<sup>38</sup> Slade, John. Narrative of the Late Proceedings and Events in China. China: Canton Register Press, 1839, p. 109 (GB).

<sup>39</sup> Delightfully found at [www.republicanchina.org/qing.html](http://www.republicanchina.org/qing.html).

evidence that he may not have destroyed the opium at all, questioning the more general legend that might be termed the Destruction Tale.

Fortunately, facts are stubborn things.<sup>40</sup> Just as Jiang Jieshi (Chiang Kai-shek) during an earlier prohibition (Feb 1934) "elevated Lin Zexu to the status of national hero while the 'Opium War' became the founding myth of Chinese nationalism," so did Chairman Mao in the 1950s promote Lin Zexu as a modern Chinese "anti-imperialist," encouraging the cinematographic creation of a legend of the "heroic activities of a saintly Commissioner Lin."<sup>41</sup> Jiang Jieshi heavily taxed his own government monopoly on opium in the 1930s; that Mao grew opium to fund the Red Army in the 1940s has been known for some time.<sup>42</sup>

Uncovering a bit of what might be true is often more interesting than inventing a complete fiction and finding out what Commissioner Lin Zexu actually did with the foreign opium in June of 1839 makes for a far richer story than even the most beautiful lie. Myths, however obscure and confused in the telling, can often betray their very real sources. For this reason it is worthwhile to inquire more closely into the origins of these various opium tales.

---

<sup>40</sup> "Facts are stubborn things, and whatever may be our wishes, our inclinations, or the dictates of our passions, they cannot alter the state of facts and evidence." - Attributed to John Adams (1735-1826) in his "Defense of the Soldiers in the Boston Massacre Trials" of December 1770, from [www.quotations.com](http://www.quotations.com); [www.law.umkc.edu](http://www.law.umkc.edu); and Adams, Charles Francis. The Works of John Adams. Vol. 1. Boston: Little, Brown and Company, 1856, p. 113 (GB).

<sup>41</sup> Dikötter, pp. 114-115; see Pickowitz, Paul G. "Zheng Junli, Complicity and the Cultural History of Socialist China, 1949-1976," in The History of the PRC (1949-1976), Julia C. Strauss, editor. The New China Quarterly Special Issues New Series, No. 7. Cambridge, UK: Cambridge University Press, 2007, pp. 202-208 (GB).

<sup>42</sup> See Morrison, Donald, "Taking Aim at Mao," 6 June 2005, *Time Magazine*, [www.time.com/time/magazine/article0,9171,501050613-1069136,00.html](http://www.time.com/time/magazine/article0,9171,501050613-1069136,00.html) and Michael Yahuda's "Bad Element," 4 June 2005, *The Guardian*, <http://books.guardian.co.uk/reviews/biography/0,6121,1498718,00.html>, both reviews of Jung Chang's and Jon Halliday's Mao: the Unknown Story, London: Jonathan Cape, 2005.

## II THE ORIGINS OF THE BURNING TALE

---

- II. THE ORIGINS OF THE BURNING TALE
  - A. THE EMPEROR'S NEW CLOSER
  - B. LIN'S FIRST EDICT TO THE FOREIGNERS
  - C. THE INITIAL FOREIGN RESPONSE
  - D. THE PREVIOUS FOREIGN EXPERIENCE
  - E. THE OFFICIAL VERSION
    - 1. LIN'S 1838 MEMORIALS TO THE EMPEROR
    - 2. THE FIRST LETTER TO THE QUEEN
    - 3. THE SECOND LETTER TO THE QUEEN
    - 4. LIN'S APRIL 1839 MEMORIAL TO THE EMPEROR
    - 5. REPORTS OF THE BURNING TALE AFTER THE EVENT
  - F. DISCUSSION

THE popular tale of the burning of the opium starts early. In fact, it begins with Lin. A week after he arrived in Canton, Lin publicly proclaimed to the foreigners that he intended to *burn* their opium.

### A. THE EMPEROR'S NEW CLOSER

The second son of a poor schoolteacher, Lin Tse-hsü was born in Hou-kuan in Fukien province in 1785 and did well on his initial examinations in the Confucian Classics "that alone could advance (him) in the governmental bureaucracy." He became an aide to the local Governor and, after passing "the highest of the examinations, the *chin-shih*, (he) joined the Hanlin Academy, which advised the

Emperor and helped him to draft documents."<sup>1</sup> Beginning in 1820, he held a number of administrative posts supervising the salt monopoly, water-control systems, tax collection and even served a term as a local judge. In late 1838, while governor-general of Hu-Kwang province, he was given a special appointment by the emperor and instructions to proceed to Canton.

Lin arrives in Canton on 10 March 1839. His official title (*chín-ch'ái ta-ch'en*, literally "royal commissioner, great minister")<sup>2</sup> is often translated "high imperial commissioner" or "high commissioner"<sup>3</sup> or "imperial commissioner" or "Special Commissioner"<sup>4</sup> and sometimes "Great Minister"<sup>5</sup> but his powers and duties are more those of a medieval Spanish Grand Inquisitor or a late 20th century United States Special Prosecutor. His duties are open-ended and broadly defined, to "proceed to this place to institute investigations"<sup>6</sup> in one translation or "to investigate port affairs"<sup>7</sup> in another.

John Slade, editor of the *Canton Register*, included a copy of the emperor's brief decree appointing Lin in his 1839 Narrative of the Late Proceedings and Events in China:

I, the emperor, on account of the daily increase of that flowing filth, opium and the great increase of sycee silver going abroad, have especially appointed Lin Tsihtseueu, the governor of Hookwang, to proceed posthaste to Canton, there to investigate and manage the affairs of the seaports, &c. ... The practice must be *stopped*: the public affairs and my peace of mind requires the

<sup>1</sup> "Lin Tse-hsü," The New Encyclopaedia Britannica. 15th edition. Chicago, IL: E. B., Inc., 1977, p. 1015; Hummel, Arthur W., editor. Eminent Chinese of the Ch'ing Period (1644-1912). Vol. I. Washington, D.C.: United States Government Printing Office, 1943, p. 511 ([www.questia.com](http://www.questia.com)).

<sup>2</sup> Chang, pp. 120, 125; *qin1 chai1 da4 chen2*, CBYWSM (TK), v. 7, p. 6b, line1.

<sup>3</sup> For example, by J. Robert Morrison and by Bridgman, *CR*, vol. 7, p. 610 (MD).

<sup>4</sup> Kuo, p. 242; Hummel, A. W., editor. Eminent Chinese of the Ch'ing Period (1644-1912). Washington, D.C.: USGPO, 1943, p. 512 ([www.questia.com](http://www.questia.com)); Waley, p. 15.

<sup>5</sup> Shuck, J. L. Portfolio Chinesis: A Collection of Authentic State Papers. Macao, China: Shuck, 1840, pp. 92-93 (GB).

<sup>6</sup> Shuck, p. 5 (GB).

<sup>7</sup> Waley, p. 12

stoppage of the opium trade. ... He (Tang Ting-ching, governor) and *Lin* must consult together and deliberate on the plan of operations, assembling all the superior officers, and then send up a duly prepared report. You, ministers, should understand my imperial will, and unite to exclude this great national evil. ... *Respect this.*<sup>8</sup>

Slade added a note: "It appears from the foregoing Gazette that the Emperor's instructions to *Lin*, the Imperial Commissioner, were of a very general nature."<sup>9</sup>

Elijah Bridgman, editor of the rival *Chinese Repository*, published a more elaborate translation of the same edict by the emperor appointing *Lin*:

The daily increasing prevalence of the use of opium, and the continually augmenting loss arising from the removal of pure silver beyond the seas, have of late years repeatedly caused Us to declare ... it to be our pleasure, that *Lin Tsihseu*, the governor of *Hookwang*, should repair with speed to the province of *Kwangtung*, to make inquiry and to act in regard to the affairs of the sea-ports; and that he should be invested with the powers and privileges of an imperial commissioner, and should have the whole naval force of the province placed under his control. ... But the buildings in which the opium undergoes preparation, the smuggling vessels in which it is conveyed, and the shops opened for its sale, or for indulgence in the use of it ... will need to be thoroughly uprooted .... We would fain think that our ministers will be enabled to ... remove from China the dire calamity. ... *Respect this.*<sup>10</sup>

Bridgman later added the comment: "His excellency *Lin*, high commissioner from the court of Peking, arrived in this city on the 10th of March. He came with plenipotentiary powers - authorized to do whatever should seem to himself right."<sup>11</sup>

To receive such a commission was evidently rare (*italics added*):

---

<sup>8</sup> Slade, John. *Narrative of the Late Proceedings and Events in China*. China: Canton Register Press, 1839, pp. 13-14 (GB), *italics Slade*. Sycee, or native lump silver; see App. A, p. 171, ftnt 1.

<sup>9</sup> Slade (1839), p. 14 (GB), *italics Slade*.

<sup>10</sup> Bridgman, Elijah. *Chinese Repository*, vol. 7, pp. 600-601 (MD).

<sup>11</sup> Bridgman, E. C. *Chinese Repository*, vol. 7, p. 610 (MD).

He was at this audience appointed imperial commissioner to put down the opium trade, and manage the affairs of the maritime frontier of Kwangtung, receiving at the time such plenipotentiary powers to act for the emperor as had *only once before* been committed to a subject since the present dynasty came upon the throne, viz. when Changling was sent to Turkestan to quell the insurrection.<sup>12</sup>

Bridgman (1839) wrote that such power had only been granted *twice* before:

At the same time the emperor put into his hands the seal of his high commissioner - investing him with power (if report be true) such as has only thrice been delegated by the monarchs of the present dynasty.<sup>13</sup>

First Lt. Bingham aboard the *Modeste* in 1841 also thought it was twice granted:

The first time to the general who commanded in the campaign against the Burmese, and lost his head for his failure; and the second time to Chang-ling, who subdued Chang-ki-hurk, the famous Mohomedan insurgent.<sup>14</sup>

As to exactly how many times this had happened previously in the nearly two hundred year old Ch'ing dynasty, Dr. Chang writes that he cannot corroborate or refute the point.<sup>15</sup> It does not appear to have been commonplace.

## B. LIN'S FIRST EDICT TO THE FOREIGNERS

Eight days after he arrived at Canton, Lin issued his first instructions to the British opium traders. In this edict he proclaimed his intention to burn all of the opium in their possession. At least three different translations were published (*italics added*):

<sup>12</sup> Williams, Samuel Wells. *The Middle Kingdom*. Vol. 1. New York: Wiley and Putnam, 1848, p. 362 (GB).

<sup>13</sup> Bridgman, *Chinese Repository*, vol. 7, p. 610 (MD).

<sup>14</sup> Bingham, J. Elliot. *Narrative of the Expedition to China*. Vol. II. 2nd edition. London: Henry Colburn, 1843, p. 44 (GB).

<sup>15</sup> Chang, p. 256.

Lin, high imperial commissioner of the Celestial Court, a director of the Board of War, and governor of Hookwang, issues his commands to the foreigners of every nation .... I find on board the warehousing vessels which you now have lying at anchor in the Lintin and other offings, there are stored up several times ten thousand chests of opium, which it is your purpose and desire illicitly to dispose of by sale. ... I proceed to issue my commands. When these commands reach the said foreign merchants, let them with all haste pay obedience thereto. Let them deliver up to government every particle of the opium on board their store-ships. Let it be ascertained by the hong merchants, who are the parties so delivering it up, and what number of chests is delivered up under each name, and what is the total quantity in catties and taels. Let these particulars be brought together in a clear tabular form, and be presented to government, in order that the opium may all be received in plain conformity thereto, that it may be *burnt and destroyed*, and that thus the evil may be entirely extirpated. There must not be the smallest atom concealed or withheld. At the same time let these foreigners give a bond, written jointly in the foreign and Chinese languages, making a declaration of this effect: 'That their vessels, which shall hereafter resort hither, will never again dare to bring opium with them: and that should any be brought, as soon as discovery shall be made of it, the goods shall be forfeited to government, and the parties shall suffer the extreme penalties of the law: and that such punishment will be willingly submitted to.'<sup>16</sup>

---

<sup>16</sup> Lin Tse-hsu. "Edict from the imperial commissioner to foreigners of all nations." *The Chinese Repository*, volume 7, May 1838 to April 1839. Canton: Bridgman, 1839, pp. 610, 612-613, [www.macaudata.com](http://www.macaudata.com). Weights and measures varied in Ch'ing China. On the internet, one *cattie* equals 604.8 grams or 1.333 pounds according to <http://en.wikipedia.org>. At [www.merriam-webster.com](http://www.merriam-webster.com), a catty is "any of various units of weight of China and Southeast Asia varying around one and one-third pounds (about 600 grams); also: a standard Chinese unit equal to 1.1023 pounds (500 grams)." The website [www.thefreedictionary.com](http://www.thefreedictionary.com) has one catty equal to 500 grams. As for *taels*, Wikipedia has one *tael* equal to 37.8 grams or 1.333 ounces. Waley says a catty then was equal to one and three-fourths pounds on page 18 of *The Opium War through Chinese Eyes*, previously cited. Shuck's *Portfolio Chinensis* (1840) says a tael or "*Jeang*, is about 593-4 grains troy, or very near 10 drachms, apothecary's weight" (p. 177). A grain, or troy grain, is 1/7000th of a pound, or 64.799 milligrams at [www.metric-conversion.org](http://www.metric-conversion.org). Wikipedia concurs and gives the difference between a troy pound equal to 5760 grains or 373.24 grams and an avoirdupois pound (English statute pound) of 7000 grains or 453.59 grams. Bullets, gunpowder, arrows and arrowheads are still



This version was drawn up immediately by the missionary J. Robert Morrison, also the "Chinese secretary and interpreter to the Superintendents of British Trade in China" and it appeared in the *Chinese Repository*, dated "March 18th, 1839."<sup>17</sup>

John Slade (1839), editor of the ideologically opposed *Canton Register*, printed a second translation of the same edict (*italics added*):

I, therefore, uniting all these circumstances, now issue this my edict, and when it reaches the said foreigners let them immediately and with due respect in conformity thereto, take all the opium in these said store-ships, and deliver it up to the officers of government; and allow the hongmerchants to examine clearly, which man by name gives up so many chests; the total weight, so many catties and taels; and let (the hongmerchants) make out a distinct list to that effect, and hand it up to the officers to be checked; that these officers may openly take possession of the whole, and have it *burned and destroyed* so as to cut off it's power of doing mischief; a single atom must not be hidden or concealed ....<sup>18</sup>

The Baptist missionary Jehu Lewis Shuck (1812-1863)<sup>19</sup> compiled, translated and published a series of Chinese government

---

measured in troy grains today, it adds. A troy ounce is still used today to weigh gold says <http://home.clara.net> adding that a grain was based on the "weight of a grain of barley (but note that money was based on a grain of wheat)" with three grains of barley equal to four grains of wheat. "However," adds Clara, "the apothecaries system also has an ounce equal to 480 grains equal to 8 drams (sometimes spelled drachms) of 60 grains each." Finally, Dr. Hsin-pao Chang of Harvard University writes in his note on currency and weights (p. xvi) that the tael, "from the Hindu *tola* through the Malayan word *tahi*" was a value of currency that "varied from time to time and place to place" as well as being a weight equal to one and one third ounce while a catty was 16 taels or one and one third pounds, a picul was 100 catties or 133 and one third pounds avoirdupois and that one tael was also equal to 10 mace and one mace to 10 candareens. So, it seems wise to accept a third more than a pound for a catty, a third more than an ounce for a tael, or roughly 600 and 38 grams, respectively, for every catty and tael.

<sup>17</sup> *CR*, vol. 7, p. 615 (MD); see appendix C.

<sup>18</sup> Slade (1839), p. 28 (GB).

<sup>19</sup> Waley, A. p. 254.

documents at Macao in 1840. On the same page he gives the Chinese characters and the English translation of each document. In the preface, he describes his translations as "independent ... mainly literal, and therefore may perhaps afford some aid to the partially advanced Student of Chinese." He notes certain problems with the "pointing" and a careless blockcutter but gives a slight but significant twist to the translation of Lin's first edict (*italics added*):

However, I now proceed to issue my commands, addressing myself to you, the said barbarian merchants that you may immediately act in obedience thereto. Do you take the Opium now on board of your store-ships and deliver the entire amount of it up to the Mandarins. Let the Hong merchants ascertain distinctly what are the names of the individuals, and what the quantity of chests delivered up, and what is the whole amount in catties and taels. Let a clearly defined schedule be drawn up and presented to the officers for their investigation; and having received the Opium, let it be *publicly burned* that its calamitous effects may be entirely put an end to. Nor must the minutest particle be stowed away and concealed.<sup>20</sup>

On the same page (91) of his English translation, Shuck lists the traditional Chinese character *hui* (third tone, Cangjie FHGE, Four Corner 9784.7) meaning "blaze, destroy by fire." The character *hui* contains the sign, *huo* (third tone, F, 9080.0), for "fire, flame, burn" as well as what can be translated as "destroy by fire, destroy, or defame."<sup>21</sup>

<sup>20</sup> Shuck, J. L. *Portfolio Chinesis: A Collection of Authentic State Papers*. Macao, China: Shuck, 1840, pp. vii-viii, 90-91 (GB); page 91 (Shuck) equals page 267 (GB) in the downloaded version; see appendix C.

<sup>21</sup> Chang, p. 311; Shuck, p. 91; [www.clearchinese.com](http://www.clearchinese.com), [www.zhong.wen](http://www.zhong.wen), [www.semamda.com](http://www.semamda.com), [www.tigernt.com](http://www.tigernt.com), [www.yellowbridge.com](http://www.yellowbridge.com), [www.mandarintools.com](http://www.mandarintools.com), and [www.mdbg.net](http://www.mdbg.net). There are several characters *hui*, with third tone (descendant-ascendant). Shuck shows the one that contains the sign *huo* (third tone) for fire listed as FHGE in the Cangjie and 9784.7 in the Four Corner systems of computer representation. It can also be translated as "burn down." The same character without the sign for fire contains the characters for dirt and destroyed, made up of mortar and pound. It can also be translated as "blaze, destroy by fire," "destroy, damage, ruin," and "defame, slander."

With Morrison's "burnt and destroyed," Slade's "burned and destroyed," and Shuck's "publicly burned," there is the immediate suspicion that either there may have been more than one circulating version of this edict or there is an inherent ambiguity in the character or both. Dr. Hsin-pao Chang of Harvard University, whose Commissioner Lin and the Opium War (Harvard University Press, 1964) is still the gold standard on the subject, and who had access to "materials in Chinese as well as in English" including the "newly published diary of the protagonist on the Chinese side, Imperial Commissioner Lin Tse-hsü,"<sup>22</sup> confirms that there were at least two slightly different English versions of this edict circulating at the time.<sup>23</sup> He does not cover this particular line of translation in his book. Dr. Chang believes the opium was destroyed.

The second, most often quoted authority on the subject is the sinologist Arthur Waley (who translated numerous volumes of poems from the Chinese), specifically his 1958 The Opium War Through Chinese Eyes. Waley relied upon the six volumes published at Shanghai in 1955 under the title *Ya-p'ien Chan-cheng Tzu-liao Ts'ung-k'an* (Corpus of Material about the Opium War), as well as other Chinese primary sources.<sup>24</sup> Waley inserts within single quotes the following (italics added): "I now call upon you to hand over for *destruction* all the opium you have on your ships and sign an undertaking that you will never bring opium here again, and that you are aware that if you are found to have done so your goods will be confiscated and you yourselves dealt with according to the law."<sup>25</sup> Waley chooses the more general "destroy" but this is clearly a condensed and paraphrased version of Morrison's much longer and more detailed translation. Waley avoids any involved discussion of what Lin actually did with the opium he confiscated from the British; he is not very interested in the details of the method Lin chose. His purpose is to tell the story of the First Opium War using

---

<sup>22</sup> Fairbank, John King in the "Foreword" to Hsin-pao Chang's 1964 work, p. viii.

<sup>23</sup> Chang, pp. 139, 259.

<sup>24</sup> Waley, A., p. 9.

<sup>25</sup> Waley, p. 34.

translations from Lin's diary. Waley also believes the opium was destroyed.

This edict was widely published and excerpted. In London, the relevant phrase was reported as (*italics added*), "I therefore ... now issue this my edict .... Take all the opium in these said store-ships and deliver it up to officers of government ... that these officers may openly take possession of the whole, and have it *burnt and destroyed*."<sup>26</sup> In Boston, it showed up as (*italics added*), "In this proclamation he says ... and have it *burnt and destroyed*."<sup>27</sup>

### C. THE INITIAL FOREIGN RESPONSE

After this, it would seem strange if many of the British opium traders did *not* believe that Lin meant to burn their opium, at least in the beginning. The language regarding the burning of the opium was made clear in a meeting on 19 March 1839 when this first edict to the foreigners was read to some of the foreign merchants and to the Chinese Cohong merchants assembled in the Consoo hall. Slade (1839) recorded an abstract of this meeting, adding that the edict to the foreigners required (*italics added*):

all foreigners to deliver up to the commissioner the opium they have afloat for the purpose of being *burnt*, and to enter into a bond never more to deal in opium, after which the local authorities will memorialize the emperor to grant them some proof of his favour, alluding evidently to compensation for the drug *burnt* ....<sup>28</sup>

Compensation was thought necessary because the opium was not by and large the property of the foreign merchants. The British Chamber of Commerce proposed an answer to Lin's edict explaining that the opium was not theirs to give up (*italics added*):

---

<sup>26</sup> "Our Relations with China," *The British and Foreign Review*, volume 10. London: Richard and J. E. Taylor, 1840, pp. 355-356 (GB).

<sup>27</sup> Sparks, Jared, editor et al. *American Almanac and Repository of Useful Knowledge*. Boston: David H. Williams, 1840, p. 325 (GB).

<sup>28</sup> Slade (1839), p. 38 (GB).

The opium on board the ships in the outer waters is what is left over from former importations as well as recent arrivals; and *being principally the property of merchants residing in Bengal and Bombay*, the resident foreigners have not the power of delivering it up according to the order of H. E. (Lin); and in many cases valuable considerations have been given in India, by advances to be paid back before the opium can be released from the control of the commanders and supracargoes of the vessels.<sup>29</sup>

This was not merely a quibble over ownership. British commercial law was harsh and strictly enforced against debtors and bankrupts in this era. John Slade, editor of the *Canton Register* and strong defender of the merchants and their trade, criticized a speech by the anti-opium merchant Charles W. King for advocating the surrender of a small amount of opium to save the hong merchants who Lin threatened to behead:

The blood of the hong merchants spilt upon the ground, appears; to have blinded Mr. King, from the tenor of his sentimental speech; and prevented his vision from contemplating the bankruptcy and utter ruin of the owners of the opium consigned to China, the ruination and destitution of families, the fall in station and society, the debtor's prison, the workhouse alms, and, probably, death by starvation to many whose all was involved in speculations in opium: this mass of human misery Mr. King could not conceive or contemplate ....<sup>30</sup>

Though Slade may have been exaggerating the consequences, the foreign merchants did strongly object to, in the words of Charles King (italics added) "giving up the property of our constituents *to be burned*; it is absurd, it is impracticable."<sup>31</sup>

King was a U. S. merchant with the firm of *Olyphant and Company* and a "vehement opponent of the opium trade."<sup>32</sup> King wrote his own personal reply to the commissioner's edict, dated 25

---

<sup>29</sup> Slade (1839), pp. 32-33 (GB).

<sup>30</sup> Slade (1839), p. 46 (GB).

<sup>31</sup> King, Charles W. *The Opium Crisis*. London: Edward Suter, Duncan and Malcolm, Hutchard and Son, 1839, p. 19 (GB), italics King.

<sup>32</sup> Warren, Samuel. *The Opium Question*. London: James Ridgway, 1840, p. 58 (GB).

March 1839, absolving and severing himself completely from any connection with the opium trade:

Your excellency's edict of the 18th instant having been communicated to the undersigned, he hereby respectfully replies - that during the many years he has been engaged in trade with Canton, he has never bought, sold, received, or delivered, one catty of opium or one tael of sycee silver; he has at the same time used his best efforts to dissuade all men from the injurious traffic ....<sup>33</sup>

King was completely convinced that Lin would burn the opium and even welcomed the idea: "The decree ... condemns the confiscated opium *to be burned* (emphasis King)."<sup>34</sup> He was so sure it would be burned that he took the opportunity to write an I-told-you-so letter (which Samuel Warren criticized as being "pervaded by a most disagreeable tone of egotism and self-sufficiency" as well as for its "little bits of plainly undigested Latin")<sup>35</sup> to Superintendent Charles Elliot. In the letter he included an imagined and feverish bit of speculation lifted directly from a cremation scene in the *Aeneid*:

Instead of kindling the fires of lust and phrenzy in the brothels and tchartchees of a hundred voluptuous cities; it is to turn to a heap of harmless ashes, on the heath, in open day. So at least, I believe. ... In place of a description, we can only assist our friends at a distance, to a sketch from the recollections of boyish days. Let us call up together the classic imagery of a well-remembered page. Imagine the *ingentem pyram, pinguem taedis et robore secto* ... the accursed trade. ... 'You idle son of Han, how name you this spot - that hill?' 'Afooyung-shan.' 'Ah! the place of the funeral pile.'<sup>36</sup>

<sup>33</sup> Bridgman, E. C. "No. 11, Mr. King's address to the imperial commissioner, Lin," *Chinese Repository*, vol. 7. Canton, China: Bridgman, 1839, p. 632 (MD).

<sup>34</sup> King, p. 25 (GB).

<sup>35</sup> Warren, pp. 62-63 (GB).

<sup>36</sup> King, pp. 25-27 (GB); Virgil's *Aeneid*, Book 6, lines 214-217: "First they erected a huge pyre, thick with pine planks and cut wood; into the sides they weave dark boughs, and they place cypresses which belong to the dead in front, and they adorn it with gleaming weapons on top (*principio pinguem taedis et robore secto/ingentem struxere pyram, cui frondibus atris/intexuunt*

Several months later King will be one of only four foreign eyewitnesses permitted to observe what actually happens to the confiscated opium.

#### D. THE PREVIOUS FOREIGN EXPERIENCE

One of the reasons for this initial foreign belief that the opium would be burned is that there had already been many previous so-called *burnings* of seized opium. Prior to Lin's arrival at Canton, the Governor-General, Teng T'ing-chen, began a crackdown on smokers, opium dens, and Chinese traders in which opium was seized and allegedly "destroyed by burning," although "hardly a foreigner believed this last. More likely, the authorities were simply reselling the stuff,"<sup>37</sup> in the words of Peter Ward Fay, who wasn't there.

In the words of Bridgman, who was, this same skepticism with regard to a public burning of "several tens of chests" in Canton in 1835 is evident (*italics added*):

Since the seizure of the drug, noticed above, was made, several reports have been current respecting the disposition that would be made of it. It is now officially announced that (they would) convey it to the military parade ground on the east of the city, and there *burn* it. That some part of the drug ... has been thus publicly destroyed is very probable; but notwithstanding this parade, no one supposes that the whole, or even the largest part of it, was *burnt*.<sup>38</sup>

And again in December 1837 and March 1838, Bridgman records his disbelief regarding these public burnings (*italics added*):

---

*latera et feralis ante cupressos/constituunt, decorantque super fulgentibus armis*)" from [www.merriampark.com/horcarm.214.htm](http://www.merriampark.com/horcarm.214.htm); the Dryden translation reads, "First, from the ground a lofty pile they rear, Of pitch trees, oaks, and pines, and unctuous fir: The fabric's front with cypress twigs they strew, and stick the sides with boughs of baleful yew. The topmost part his glitt'ring arms adorn ..." from <http://classics.mit.edu/Virgil/aeneid.6.vi.html>.

<sup>37</sup> Fay, p. 119.

<sup>38</sup> "Burning of Opium," *Chinese Repository*, vol. III, p. 488 (MD).

And to crown the farce, local authorities go in state to the place of military parade and *burn* the drug: the transaction is duly reported in the provincial court circular, and will forever stand on the records of the fooyuen's office! Now no one, who knows, the Chinese, believes that a pound of opium was *burnt*; while every one does know that official boats have been the chief agents of carrying the drug! ...

*Burning of opium* (italics Bridgman) was announced in the Court Circular of Canton on the 20th instant, as having been enacted that day under the direction of the local authorities. This farce is becoming of frequent occurrence, while the smuggling of the drug is carried on to an extent here never before witnessed.<sup>39</sup>

At least one twentieth century investigator thinks that once he arrived at Canton, Lin also burned opium (italics added): "Smugglers were executed, and addicts were flogged or made to wear the *cangue*.<sup>40</sup> Opium dens were raided, thousands of cakes of opium were *burned* and thousands of pipes were confiscated."<sup>41</sup> But more careful scholarship does not reveal this. In the first sixteen weeks after his arrival, "Commissioner Lin put five times as many people in prison and confiscated seven times as many opium pipes as Governor Teng had done in three years."<sup>42</sup> The result of Lin's earlier 15 March 1839 edict to the Chinese is said by Dr. Chang to have been dramatic:

By May 12, as many as 1,600 violators had been arrested, and 28,845 cattles of opium and 42,741 opium pipes had been confiscated. In the next seven weeks 192 Chinese were convicted for violating prohibition laws, and more

<sup>39</sup> *CR*, vol. 6, pp. 400, 552 (MD).

<sup>40</sup> "The '*kea*' or '*cangue*' is a wooden collar from three to four feet square, having the crime for which it is worn engraven on it. This wooden pillory is sometimes worn for a month, during which period the wearer must be fed by others," says then First Lt. Bingham, John Elliot in his Narrative of the Expedition to China, 2nd ed., vol. 1. London: Henry Colburn, 1843, p. 30 (GB).

<sup>41</sup> Tamura, Eileen. China: Understanding its Past. Honolulu, HI: University of Hawaii Press, 1998, p. 97 (GB).

<sup>42</sup> Chang, p. 129.



than 11,000 catties of opium and 27,538 opium pipes were turned over to the government.<sup>43</sup>

But how Lin disposed of the 39,845 catties of confiscated Chinese opium is left unstated.

#### E. THE OFFICIAL VERSION

Though it is difficult to find examples of the Burning Tale in Lin's other edicts and communications either to the Chinese, the Cohong or the foreign merchants, this will not be the last time Lin speaks of it. In official communications to the emperor of China and the queen of England, and even from the emperor to the Privy Council, opium will be burned, is being burned or has been burned. It is also reported after the fact as having been burned in anonymous communications as well as in official Japanese reports of the event.

##### 1. LIN'S 1838 MEMORIALS TO THE EMPEROR

During the ongoing debate in the late 1830s over the problem of the outflow of silver, many memorials were written to the emperor suggesting remedies. Lin wrote three. In the first, received 10 July 1838, he proposed: "All the opium surrendered ought to be destroyed in the presence of the due authorities, burning it with wutung-oil and then throwing it away into the rivers."<sup>44</sup> The CBYWSM online shows the character *shao* (first tone), meaning burn, roast, or bake.<sup>45</sup> In the second memorial, he inspected seized and surrendered pipes and opium and then "broke them with a sword and burned them by fire. ... (W)e mixed them with wutung-oil, thoroughly burned them, and threw them away into the midst of the rivers."<sup>46</sup>

---

<sup>43</sup> Chang, p. 129.

<sup>44</sup> Kuo, p. 224.

<sup>45</sup> CBYWSM (TK), volume 2, page 24a, line 3, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024401](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024401); *shao* contains the sign for fire, *huo*.

<sup>46</sup> Kuo, p. 81.

## 2. THE FIRST LETTER TO THE QUEEN

Lin wrote a letter to Queen Victoria of England, not once but twice.<sup>47</sup> Lydia He Liu considers them one single letter, but two separate drafts. The earlier version was indeed entitled "*Ni yu yingjili guowang xi* (a draft declaration to the sovereign of England)."<sup>48</sup> Chang implies they were two separate letters.<sup>49</sup> Waley sees them as different versions.<sup>50</sup> For the purpose of argument and to avoid confusion, they can be considered two different letters (even though the first was never sent and the second sent but never received) because while they contain many similarities, they were written some six to nine months apart and differ in purpose, content and style.<sup>51</sup>

Some still mistakenly suppose there was only one letter (or version) that originated with the emperor. In Peking, Lin had discussed the idea of a letter "during an audience with the emperor" and recommended an imperial edict "addressed to the sovereign of England." Once he arrived in Canton, "he changed his mind and decided that no communication should be addressed to the British crown by the emperor because of the lack of a dignified mode of conveying it."<sup>52</sup>

Instead, he decided to write one of his own. Lin discussed his own first letter to the queen in a meeting with local government officials in Canton as early as March 16, 1839.<sup>53</sup> It was soon

<sup>47</sup> *CR*, vol. 8, pp. 9-12, 497-503 (MD).

<sup>48</sup> Liu, Lydia He. *The Clash of Empires*. Cambridge: Harvard University Press, 2004, p. 229 (GB).

<sup>49</sup> Chang, Hsin-pao. *Commissioner Lin and the Opium War*. Cambridge, MA: Harvard University Press, 1964, pp. 134, 136.

<sup>50</sup> Waley, Arthur. *The Opium War through Chinese Eyes*. Stanford, CA: Stanford University Press, 1968, p. 28.

<sup>51</sup> For argument, see Waley, p. 28; Chang, pp. 134-136, and of course, the letters themselves, in Bridgman, E. C. *The Chinese Repository*, volume VIII, May 1839 to April 1840. Canton: Bridgman, 1840, pp. 9-12, 497-503, [www.macaudata.com](http://www.macaudata.com).

<sup>52</sup> Chang, pp. 133-134.

<sup>53</sup> Waley, p. 28.

circulating, dated "the second lunar month (March 15-April 13)" and was "made public just as Lin was about to go to the Bogue to receive the British opium on April 10."<sup>54</sup> This first letter was "permitted to obtain circulation among the people, in the same manner as many official documents commonly do."<sup>55</sup> Because of a near universal literacy, the "designs of the Chinese Government are usually made known beforehand by public Proclamations, written (and sometimes printed) in very large and legible characters, and pasted up at all the most frequented thoroughfares, stamped with the red seals of the high officers who issue them."<sup>56</sup>

In this first letter to the queen, Lin refers to a policy of burning any opium confiscated in China (*italics added*): "whatever opium can be discovered in this land is entirely *committed to the flames, and consumed*. If any be again introduced in foreign vessels, it too must be subjected to a *like process of destruction*."<sup>57</sup> In this version printed in the *Chinese Repository*, it reads almost unintentionally ironic. Indeed, this is how opium was often consumed, by holding a sticky drop on the end of a needle near a flame and then sucking the smoke through a long pipe.<sup>58</sup> Waley's translation of this first letter is considerably different (*italics added*): "All opium discovered in China is being *cast into burning oil* and destroyed. Any foreign ships that in the future arrive with opium on board, will be *set fire* to, and any other goods that they are carrying will inevitably be *burnt* along with the opium."<sup>59</sup>

### 3. THE SECOND LETTER TO THE QUEEN

This second letter (or the official version) was written by Lin some six months and not finished until some nine months after the

---

<sup>54</sup> Chang, p. 134.

<sup>55</sup> Bridgman, *CR*, vol. 8, p. 9 (MD).

<sup>56</sup> Shuck, J. L. *Portfolio Chinensis: A Collection of Authentic Chinese State Papers*. Macao, China: Shuck, 1840, p. vii (GB).

<sup>57</sup> *CR*, vol. 8, p. 11 (MD); see appendix C.

<sup>58</sup> Fay, Peter Ward. *The Opium War 1840-1842*. Chapel Hill, NC: University of North Carolina Press, 1975, pp. 8-9.

<sup>59</sup> Waley, p. 31.

first. On 17 June 1839 Lin met with Bridgman and King who had come to witness what Lin was doing with the opium. At this meeting Lin "inquired about the best mode of conveying communications to Queen Victoria and other European sovereigns."<sup>60</sup> Chang adds that on 19 July,

Lin received from the Board of Punishment the new statute concerning the penalty for foreigners convicted of smuggling opium. Lin then drew up a memorial in which he reopened the question of how to communicate with European sovereigns in order to make the new law known to the various foreign governments.<sup>61</sup>

In this new memorial to the emperor, he included a draft of the second letter to the queen.<sup>62</sup> Waley says "the draft of his new version of the letter to Queen Victoria" wasn't sent to the emperor (for his approval) until 3 August 1839.<sup>63</sup>

Bridgman published in 1840 a copy of the second letter, which had previously appeared in the *Canton Press*. In it, Lin refers to the events of the previous months (*italics added*): "... that they took 20,283 chests of opium piled up in their store-ships, and through Elliot, the superintendent of the trade of your said country, petitioned that they might be delivered up to us, when the same were all utterly *destroyed*."<sup>64</sup>

But Shuck's more literal translation is again conspicuously different on this point (*italics added*): "and imploringly begging for mercy, they took from their store ships twenty thousand two hundred and eighty three chests of Opium, and through their said country's Superintendent, Elliot, by petition, requested that the

---

<sup>60</sup> Chang, p. 136.

<sup>61</sup> Chang, p. 136.

<sup>62</sup> Chang, p. 136.

<sup>63</sup> Waley, pp. 57-58.

<sup>64</sup> *CR*, vol. 8, p. 498 (MD); see appendix C.

surrender might be received, the whole of which was done and *destroyed by fire*."<sup>65</sup>

Shuck notes the discrepancies in this passage and adds two footnotes in the back of his book:

53. Page 132. All Chinese official accounts represent the surrender on the part of foreigners as voluntary and repentant; but it is known to both natives and foreigners that the surrender was forced by threats of starvation and death.

54. Page 132. It was a question after the Opium had been surrendered, What should be done with it? The Emperor however soon gave orders for every catty to be destroyed, which was accordingly done by means of lime and salt and water.<sup>66</sup>

He does not explain any further, however, why Lin would report after the fact that the opium had been "destroyed by fire." Shuck, who could have read the version of the letter published in the *Chinese Repository* (as well as Bridgman's description of what was actually done with the opium), does not try to explain why that other unknown translator would choose to use the word, "destroyed" and not the literal translation, "destroyed by fire." Nor does the problem seem to be in the translation. Shuck's Chinese characters on the same page (132) of his English translation show *ya-p'ien* for opium, *I-lü* for Charles Elliot, as well as the same traditional character *hui* for "blaze, destroy by fire" that Lin used in his first edict to the foreigners, causing Shuck to include a footnote to explain the discrepancy.<sup>67</sup>

Why would Lin use this character, *hui* or "blaze, destroy by fire" in a proposed letter to the queen long after the fact? Lin had already memorialized the emperor that summer twice "informing him of the method and progress of the destruction, and the emperor wrote back

---

<sup>65</sup> Shuck, J. L. *Portfolio Chinensis: A Collection of Authentic Chinese State Papers*. Macao, China: Shuck, 1840, p. 132 (GB); page 132 Shuck equals page 306 (GB) in the downloaded version; see appendix C.

<sup>66</sup> Shuck, p. 181 (GB).

<sup>67</sup> Chang, pp. 305, 311; Shuck, p. 132; [www.clearchinese.com](http://www.clearchinese.com).

his approval."<sup>68</sup> So both Lin and the emperor are well aware that the opium was *not* burned or destroyed by fire, but had been soaked in water, lime and salt. Had Lin meant only the more general "destroyed," he could have chosen a number of other characters. Of course, Lin's second letter was not meant for the emperor but for the queen of a barbarian foreign country.

An online version of the *Chou Ban Yi Wu Shi Mo* contains the original draft of the second letter that Lin sent to the emperor in late July or early August 1839. Though there are substantial differences between this version and the one finally revised and sent in 1840 as published by Shuck, both versions agree on this point, using the same character *hui* (third tone), with sign for fire, *huo* (third tone) meaning "destroyed by fire" to describe what happened to the barbarian opium.<sup>69</sup>

Other than this one specific reference to the foreign opium as having been burned, the second letter to the queen curiously differs from the first in that it no longer makes reference that any opium in China will be burned when it is discovered. Lin only demands that any such opium be surrendered during a grace period but makes *no* suggestion, as he did in the first letter (or draft), that it might be burned (*italics added*):

Any one who within the next year and a half may by mistake bring opium to this country, if he will but voluntarily come forward, and *deliver up* the entire quantity, he shall be absolved from all punishment for his crime.<sup>70</sup>

The Shuck translation is very similar (*italics added*):

Any one who, within the space of one year and six months brings Opium by mistake, if he will, of his own accord, *surrender up* the entire quantity of it, will escape the punishment due for his crime.<sup>71</sup>

<sup>68</sup> Chang, p. 174.

<sup>69</sup> *Chou Ban Yi Wu Shi Mo* (Reign of Dao Guang), volume 7, page 34a, line 5, found at [www.cadal.zju.edu.cn/reader.action?bookNo=02024402](http://www.cadal.zju.edu.cn/reader.action?bookNo=02024402).

<sup>70</sup> *CR*, vol. 8, p. 502 (MD).

<sup>71</sup> Shuck, pp. 145-146 (GB).

The emperor approved Lin's letter on August 27 but Lin continued to check and revise it. As late as 16 Dec it was being proofread by Dr. Hill, surgeon of the shipwrecked *Sunda*. In January of 1840 it was sent via Captain Warner of the *Thomas Coutts*. Back in England, Warner tried to deliver the letter but the Foreign Office simply refused to meet with him.<sup>72</sup>

#### 4. LIN'S APRIL 1839 MEMORIAL TO THE EMPEROR

Lin wrote a memorial to the emperor in early April the day after the barbarians began to surrender their opium. Lin was given the first fifty chests on 11 April 1839.<sup>73</sup> On 12 April Lin sent a memorial to the emperor saying that he had begun receiving the foreign opium from the store-ships and that Superintendent Elliot had accounted for 20,283 chests. Dr. Chang does not include this particular memorial in his book, saying only (*italics added*): "On April 12, the day after the opium receiving had begun, Lin Tse-hsü memorialized the emperor suggesting that all the opium be shipped to Peking for examination before it was *destroyed*."<sup>74</sup>

Kuo, however, translates this document directly from the *Ch'ou Pan Yi Wu Shih Mo* (*italics added*):

And considering the fact that the opium surrendered by the barbarians is unique in its amount, it seems natural that the original chests should be moved to Peking to be duly examined and *burned*. By so doing, everything will be certain and clear. But we wish to know your Imperial Will as to whether this is a proper measure.<sup>75</sup>

Kuo translates "burned" while Chang paraphrases "destroyed." The online version of the *Chou Ban Yi Wu Shi Mo* uses two characters to represent what Lin suggested be done with the opium once it arrived in Peking. The first is *shao* (first tone), meaning burn, bake or roast, and contains the sign for fire, *huo* (third tone).

<sup>72</sup> Chang, pp. 137-138.

<sup>73</sup> Chang, pp. 168-169; Waley, p. 40.

<sup>74</sup> Chang, p. 172.

<sup>75</sup> Kuo, p. 242.

The second is again *hui* (third tone), also with the sign for fire, *huo*, the same character used in his first edict to the foreigners and the second letter to the queen. When written together, they translate as burn or burn down.<sup>76</sup>

So as late as 12 April 1839, a month after arriving in Canton, and one day after he has begun to receive the opium, Lin is still talking about burning the opium (in the Kuo translation and in the online version of the original) but only in official correspondence with the Chinese throne.

## 5. REPORTS OF THE BURNING TALE AFTER THE EVENT

Even immediately after the event, at least one person living there at the time believed that the opium had been burned. An anonymous Chinese author of a paper extensively circulated during the war asked (italics added), "What advantage was it to the state or the people to have *burned* the opium? Could he thereby prevent the barbarians from bringing a fresh supply?"<sup>77</sup>

It was reported as having been burned in Japan. The *Ahen Fusetsugaki* (Reports about the Opium), a detailed annual chronicle about the importation of opium into China, reported on (italics added) "the sending of Lin Zexu to Guangdong (and) his *incineration* of the opium of the English merchants." As well, Sato Chin'en in the *Kairiku senbo roku* (An Account of Military Defenses on Sea and Land) reported that Lin (italics added) "had the English opium brought before him, and *burned* it entirely."<sup>78</sup>

Even the emperor, after the fact, refers to the opium specifically as having been burned. In a letter to the Privy Council dated 4 September 1840, he twice addresses the issue of the British demand

<sup>76</sup> CBYWSM (TK), volume 6, page 16a, line 2, found at [www.cadal.zju.edu.cn/Reader.action?bookNo=02024401](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024401). Translation given by [www.mdbg.net](http://www.mdbg.net), [www.tigernt.com](http://www.tigernt.com) and [www.yellowbridge.com](http://www.yellowbridge.com).

<sup>77</sup> Davis, J. F. *China, During the War and Since the Peace*. London: Spottiswoodes and Shaw, 1852, p. 142 (GB).

<sup>78</sup> Wataru, Masuda. *Japan and China: Mutual Representations in the Modern Era* (trans. Joshua A. Fogel). New York: St. Martin's Press, 2000, p. 39 (GB).



for compensation for the opium (*italics added*): "Now, opium is a contraband article. It had been *burned* and destroyed. What reason is there that it should be indemnified?" and, "As to the opium, it had been *burned* and destroyed. Certainly there is no reason why it should be indemnified."<sup>79</sup>

This is Kuo's translation from the original Chinese documents and he uses the phrase twice in succession. This seems like a disingenuous use of the word on the part of the emperor. The opium certainly had not been burned in the primary sense of the English infinitive, "to burn," which is to set fire to something, to incinerate. To use the word in this manner without any further clarification is to deliberately obfuscate and misconstrue the facts. Yet the original document available online shows the same characters *shao1* (Four Corner 9481.1), meaning "burn, cook, stew, bake, roast" and *hui3* (Four Corner 9784.7), both containing the fire sign, *huo* (third tone), both used in Lin's memorial to the emperor of 12 April. Together, they translate unambiguously as burn or burn down.<sup>80</sup> This letter is from the emperor to the Privy Council, explaining an official version of events. Kuo adds no explanatory note.

## F. DISCUSSION

The genesis of the burning tale begins with Lin. There are two separate issues to consider: what Lin means and what others think Lin means. Both appear to be identical in March 1839. Lin issued an edict to the foreigners stating that he intended to burn any opium surrendered. In Shuck's version Lin clearly intends at this moment (18 March 1839), before he has received any, to publicly burn the opium if and when it is surrendered. In the Morrison and Slade translations of this edict it will at least be burned. Waley paraphrases "destroyed." Initially, the foreign merchants believed that Lin intended to burn the opium. Slade records this belief in the *Canton Register*. The U.S. merchant King was utterly convinced it

<sup>79</sup> Kuo, pp. 259-260.

<sup>80</sup> CBYWSM (TK) volume 13, page 40b, lines 6 and 10, found at [www.cadal.zju.edu.cn/Reader.action?bookNo=02024408](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024408). Translation given by [www.mdbg.net](http://www.mdbg.net), [www.tigernt.com](http://www.tigernt.com), and [www.yellowbridge.com](http://www.yellowbridge.com).

would be burned. Supposedly, Governor-General Ting had already burned it before Lin's arrival, according to Bridgman. At least one modern author reports second hand that Lin burned confiscated Chinese opium while in Canton. But Dr. Hsin-pao Chang more carefully says only that Lin confiscated it, disposal method unstated.

Lin's two memorials in 1838 suggest opium be burned or was burned. Lin's first letter to Queen Victoria states that opium in China is committed to the flames or cast into burning oil. Once he began receiving it, Lin suggested that the emperor burn it in Beijing. Chang paraphrases "destroyed." The original document online suggests "burn" or "burn down" is more accurate. Lin's second letter to the queen reports it was destroyed by fire in the Shuck translation which uses the same character *hui* that Lin selected for his first edict to the foreigners. The draft version of the second letter recorded online in the CBYWSM confirms the same character. All other references to burning have been excised from the second version of the letter. After the event, both official Japanese and anonymous Chinese accounts report that it had been incinerated or burned. The emperor reports it was definitely burned in the translation by Kuo and in the original available online.

In correspondence intended for the emperor, the queen of a foreign nation, and from the emperor to the Privy Council, the language of the burning of the opium continues. It is as if there is an official ideological version of events and a private version, and both exist separately and simultaneously in the China of the early 19th century. Of course, the same is true in the China of the early 21st century as well, nor can this example of political dichotomy be considered unique to any one nation. Adherence to an ideology is often seen as evidence of loyalty, considered in itself by some a virtue.

Finally, the Burning Tale has a certain coherent logic. Why wouldn't the opium have simply been burned? Burning was and is a simple, cheap and efficient method of disposing of unwanted material. Bridgman records various showy "burnings" in the *Chinese Repository*. Illegal drugs are often publicly incinerated in many nations in the 21st century, or so it is believed.

The Burning Tale begins with Lin and there are more than enough subsequent references for an unwary investigator to conclude that the opium confiscated from the British merchants in the spring of 1839 was burned. But this won't explain away the popularity of the story. Public burnings are common rites in many cultures, notably at festivals during the summer and winter solstices. Obviously symbolic of the apparent cyclic journey of the sun, the fire in these ceremonies is thought to be something sympathetic, even creative. But Sir James George Frazer suggests another motivation may be equally at play:

It remains to consider what can be said ... in favour of the view that in these rites fire is employed not as a creative but as a cleansing agent, which purifies men, animals and plants by burning up and consuming the noxious elements, whether material or spiritual, which menace all living things with disease and death. ... The conception of fire as a destructive agent, which can be turned to account for the consumption of evil things, is so simple and obvious that it could hardly escape the minds even of the rude peasantry with whom these festivals originated. ... Now in the case of the fire-festivals the destructive aspect of fire is one upon which the people dwell again and again; and it is highly significant that the great evil against which the fire is directed appears to be witchcraft.<sup>81</sup>

In the ever popular Burning Tale an evil thing (opium) is clearly being purified by the flames.

---

<sup>81</sup> Frazer, James George. *The Golden Bough: A Study in Magic and Religion*. London: Penguin Books, 1996, pp. 777-778 (GB), from the author's abridged edition of 1922.

## III THE ORIGINS OF THE DROWNING TALE

---

- III. THE ORIGINS OF THE DROWNING TALE
- A. THE FIRST LETTER TO THE QUEEN
  - B. THE SECOND LETTER TO THE QUEEN
  - C. LIN'S 1838 MEMORIALS TO THE EMPEROR
  - D. LIN'S ADDRESS TO THE SPIRIT OF THE SEA
  - E. LIN'S PROCLAMATION
  - F. LIN'S FIRST EDICT TO THE FOREIGNERS
  - G. DISCUSSION

THIS tale also begins with Lin. In some versions he throws the opium into the sea. In others he throws the ashes of the burnt opium into the sea. Sometimes he does both, simultaneously or consecutively.

### A. THE FIRST LETTER TO THE QUEEN

In the previous chapter, Lin's first letter to the queen generated more versions of the Burning Tale when he spoke of the opium in China. However, this same letter also refers to the destruction of opium by water, though not for Chinese opium. Lin suggests in the first letter to the queen a different remedy for the opium in India, saying (*italics added*) "we would have your honorable nation issue mandates for the collection thereof, that the whole may be *cast into the depths of the sea*."<sup>1</sup> Waley translates this passage as (*italics added*), "Your Majesty must immediately search out and *throw it to the bottom of the sea*."<sup>2</sup> It is a small but important point, often misconstrued, to remember that in context,

---

<sup>1</sup> *CR*, vol. 8, p. 11 (MD).

<sup>2</sup> Waley, p. 30.

Lin is speaking of the opium "in the nations under your dominion"<sup>3</sup> or "your dependencies,"<sup>4</sup> referring here to the opium in India, not China.

So, in this first letter (or draft) to the queen there are the beginnings of several stories, of burning ships, of oil, of flames, and of the sea, depending upon which method of disposal of which opium in what country and which translation is preferred. Though in both translations of this first letter to the queen, Lin clearly makes the same distinction: fire for the opium in China, water for the opium in India.

## B. THE SECOND LETTER TO THE QUEEN

In the second letter (or official version), he says nothing about throwing the Indian opium into the sea but suggests still another remedy:

You, the queen of the said honorable nation, ought immediately to have the plant in those parts plucked up the very root! Cause the land there to be hoed up afresh, sow in its stead the five grains, and if any man dare again to plant in these grounds a single poppy, visit his crime with the most severe punishment.<sup>5</sup>

Shuck's Portfolio Chinensis has a slightly different translation that mentions not just the poppy but Opium:

And, you the Sovereign of your honourable Kingdom, ought determinately, in the above places, to have the whole plucked up by the roots, and cause the ground to be dug up, and transformed by planting the five grains;<sup>6</sup> and if there

<sup>3</sup> *CR*, vol. 8, p. 11 (MD).

<sup>4</sup> Waley, p. 30.

<sup>5</sup> *CR*, vol. 8, p. 501 (MD).

<sup>6</sup> Shuck adds a note on page 181 (GB): "The *Woo-kuh*, *five grains* here alluded to are *Taou*, paddy (i.e. unhusked rice); *Leang*, Barbadoes millet; *Mih*, wheat; *Shoo*, common millet; and *Theih*, which means a species of small millet, and is sometimes used also to signify the divinity which presides over all grain."

be any one who should again dare schemingly to plant or manufacture Opium, do you award the heaviest punishment for his crimes.<sup>7</sup>

The water mentioned in the first letter for the opium in India is missing in the second letter, replaced by a digging up and replanting. As was seen in chapter two, the fire for Chinese opium in the first letter was replaced with a voluntary surrender. In the second letter, only the reference to the specific June burning of the foreign opium remains.

### C. LIN'S 1838 MEMORIALS TO THE EMPEROR

Noticed already in chapter two, throwing away the ashes (not the opium) into the rivers (not the sea) shows up in two of Lin's early memorials to the emperor. On 10 July 1838 the first of three memorials by Lin suggesting remedies for the outflow of silver<sup>8</sup> was received in Peking. In this memorial, he says that "(a)ll the opium surrendered ought to be destroyed in the presence of the due authorities, burning it with wu-tung oil and then throwing it away into the rivers."<sup>9</sup> In the second memorial received 5 October 1838 he says that is exactly what he did, reporting that "we mixed them with wu-tung oil, thoroughly burned them, and threw them away into the midst of the rivers,"<sup>10</sup> speaking of the various pipes and the opium he had confiscated when he was governor-general of Hu-kwang. Hu-kwang was an interior (not a maritime) province made up Hubei and Hunan whose capital was Wuchang (Wuhan), a center of trade and transportation in central China under the Qing Dynasty, sited where the Changjiang (Yangtze) meets its longest tributary, the Hanjiang.<sup>11</sup>

---

<sup>7</sup> Shuck, pp. 141-142 (GB).

<sup>8</sup> See Appendix A-Silver, Salt and Opium.

<sup>9</sup> Shuck (1840), p. 224.

<sup>10</sup> Shuck (1840), p. 81.

<sup>11</sup> According to Wikipedia, [www.travelchinaguide.com](http://www.travelchinaguide.com), [www.invasive.org](http://www.invasive.org), [www.infomutt.com](http://www.infomutt.com), and <http://home.olemiss.edu>.

## D. LIN'S ADDRESS TO THE SPIRIT OF THE SEA

Throwing away the opium (not the ashes) into the sea (not the rivers) shows up in Waley's translation of Lin's Address to the Spirit of the Sea, composed during Lin's first few months at Canton. Waley encloses within single quotes: "If it had been cast into the flames, the charred remains might have been collected. Far better to hurl it into the depths, to mingle with the giant floods."<sup>12</sup> Dr. Chang writes: "On the 19th, the day after the last chest of opium had been surrendered, Lin composed a prayer to the God of the Sea (*Chi Hai-shen wen*) that all aquatic animals might take refuge when the decomposed opium was thrown into the ocean."<sup>13</sup>

## E. LIN'S PROCLAMATION

Throwing away "transmuted" or "destroyed" opium and its "dregs" (not ashes) shows up in a translation of Lin's proclamation in Bridgman's *Chinese Repository* describing how he will dispose of the surrendered foreign opium (italics added): "There stone trenches will be opened; and lime and salt will be taken and mixed with the opium, until the drug is completely transmuted and destroyed. Then it will be *poured off into the midst of the sea, even the very dregs*."<sup>14</sup> The translation given by Slade reports (italics added) "the excavation of a stone lined trench, into which the opium is to be thrown, and mixed and stirred up with unslaked lime and rock salt, and be thus destroyed before the eyes of all the civil and military officers, and the *dregs be then cast into the sea*."<sup>15</sup> In this version it is dregs (not opium or its ashes) that are being thrown into the sea (not the rivers) of the maritime province of Kwangtung.

---

<sup>12</sup> Waley, pp. 44-45.

<sup>13</sup> Chang, p. 173.

<sup>14</sup> Bridgman, *Chinese Repository*, vol. 8, May 1839, p. 36 (MD).

<sup>15</sup> Slade (1839), p. 110 (GB).

## F. LIN'S FIRST EDICT TO THE FOREIGNERS

Interestingly enough, Lin implicitly rules out the option of throwing the opium itself into the sea in his first edict to the foreigners of 18 March 1839. In this edict, Lin informs them of the law in China, finds them guilty, commutes their sentence, establishes parole conditions and then lists a long series of possible actions by the foreigners that would constitute breach of good faith and therefore noncompliance with the terms and conditions of his verdict and which therefore would submit them under said Chinese law to death,<sup>16</sup> capital punishment<sup>17</sup> or "the extreme penalty of the laws."<sup>18</sup> One of these actions would be to lie by telling him that they were going to take the opium and "throw it into the sea,"<sup>19</sup> or "throw it into the midst of the sea"<sup>20</sup> in Shuck's more literal translation.

## G. DISCUSSION

Lin's first letter to the queen of England argues that the opium in India, not that already in China, should be thrown to the bottom of the sea. In this first letter (or draft) the opium already in China will be burned. In the second letter both of these references have been changed: Indian opium should be dug up and the land replanted with the five grains and Chinese opium will simply be confiscated, disposition unstated. Why there has been this change in method from the one letter (or draft) to the next is curious and is generally unremarked upon. It is both factual and fair to state that the first letter was written before he possessed the opium and the second one after he had already disposed of it. Lin's early memorials to the emperor in 1838 depict a burning of confiscated opium with fire and wu-tung oil. The remnants, if any, are then thrown away into the rivers of Hu-kwang province. In May 1839 Lin writes a poem to the Sea Goddess who needs an explanation as

---

<sup>16</sup> Slade (1839), p. 27 (GB).

<sup>17</sup> Shuck (1840), p. 87 (GB).

<sup>18</sup> *CR*, vol. 7, p. 611 (MD).

<sup>19</sup> Slade (1839), p. 29; *CR*, vol. 7, p. 613 (MD).

<sup>20</sup> Shuck (1840), p. 94 (GB).



to why he is not simply burning it but has instead decided to decompose it. Lin's proclamation of late May or early June states that the dregs resulting from his new process will be sent to the sea. He will not allow the foreigners to throw the opium into the sea, however, an act that might be thought to be equivalent from the point of view of where he says it will eventually arrive. This option is ruled out from the beginning in his first edict to the foreigners of 18 March. If opium or its dregs are to reach the sea, it will be done by Lin not the foreign traders.

In the Drowning Tale, something (either opium, ashes or dregs) is being thrown somewhere (rivers or sea). For those who enjoy this version of the story, the fundamental symbolism is that something evil is being hurled, thrown, sunk or cast down somewhere where it will do no further harm. Evil is expunged just as it was purified in the Burning Tale. Though the Drowning Tale is still popular, simply throwing the opium into the sea was ruled out by Lin from the very beginning. As will be discovered in chapter nine, Lin was very particular that the opium dregs, or siftings as he later calls them, never reached either the river or the sea.

## IV THE ORIGINS OF THE SAILING AWAY TALE

---

- IV. THE ORIGINS OF THE SAILING AWAY TALE
- A. THE BRITISH CHAMBER OF COMMERCE RESPONSE
  - B. PREVIOUS CHINESE COMMUNICATIONS
  - C. CONTRADICTORY EVIDENCE
  - D. DISCUSSION

IN this story Lin does not want the opium; he just wants it gone. But this reads into the language of Lin's edicts and the words of Wu Bingjian (chief of the hong merchants), motivations that neither had. Warnings to sail away had previously been issued by the emperor, governor and admiral. The British hoped that Lin would permit this option. In the Sailing Away Tale, the opium would be permitted by Lin to leave Chinese waters. But Lin specifically ruled out simply sailing away with the opium.

### A. THE BRITISH CHAMBER OF COMMERCE RESPONSE

The genesis of the story that Lin wanted the store ships to sail away with their opium or would permit such an action may derive from a response to Lin's edicts drafted on 20 March by the chairman and vice-chairman of the British General Chamber of Commerce: "They (the foreign residents at Canton) will also take every measure in their power to induce the vessels in the outer waters to depart immediately to their respective countries ...."<sup>1</sup> This proposed answer was voted down on the morning of 21 March 1839 and a simple short note acknowledging the receipt of the edicts was approved instead.<sup>2</sup>

---

<sup>1</sup> Slade (1839), p. 33 (GB).

<sup>2</sup> Slade (1839), pp. 37-38 (GB).

The British Chamber of Commerce was clearly interested in exploring this option but it is very unlikely that Wu Bingjian, chief of the hong merchants, ever suggested that the foreign receiving ships should depart or that the commissioner would allow them to depart. The Hong merchants were questioned closely by the British merchants as to the meaning implied in Lin's edicts (*italics added*):

Q - If one thousand chests are given up, what security can you give that *the ships may proceed without molestation?*

A - We refer to the edict, and cannot answer. ...

Q - If the foreigners deliver up the opium now outside, which is their own property, will the commissioner rest satisfied, and permit *the unmolested departure of the vessels* with the portion belonging to non-residents?

A - We cannot give a definite reply to this question ....<sup>3</sup>

When questioned directly about the possibility of the commissioner allowing the opium ships to simply depart, the hong merchants are perfectly noncommittal.

## B. PREVIOUS CHINESE COMMUNICATIONS

The foreigners may have hoped that Lin would permit the ships to depart with the opium because of a warning issued in January 1839 prior to Lin's arrival by then Governor Tang:

We, the governor and Fooyuen uniting all those circumstances, now issue this proclamation, with the utmost, - the most intense earnestness! When it reaches the said foreigners, let them instantly divest themselves of their precious filth, and taking all the opium receiving ships anchored outside, cause one and all of them, with the utmost haste, to return to their native countries!<sup>4</sup>

This is the translation by Mr. Thom published by Slade. The translation by John Robert Morrison was published in Bridgman's *Repository*:

<sup>3</sup> Slade (1839), pp. 43-44 (GB).

<sup>4</sup> Slade (1839), p. 16 (GB).

We proceed hereon to issue, with intense earnestness, our commands. Upon their reaching the said foreign merchants, let them immediately wash out their past defilements; and let them speedily send away to their countries one and all of the warehousing vessels now anchored in the outer seas.<sup>5</sup>

While Tang may have permitted, even cautioned them to leave, Lin will soon show that he has no intention of allowing the foreign ships to leave with their opium.

Slade (1839) also gives intelligence that after Lin arrived in Canton, the naval officers and even their admiral warned the foreign opium ships to depart:

The commissioner had not on his arrival determined who he should first attack; but the naval officers at the Bocca Tigris were under well-grounded apprehensions that they would be the first victims of the plenipotentiary. They, therefore, used their most strenuous endeavors to prevail upon the commanders of opium ships to sail away; and the admiral even sent a delegation to Macao for that purpose.<sup>6</sup>

Similar language demanding the ships sail away can be found in other Chinese edicts that date back at least to 1836 during the debate over relegalization. In a letter requesting the prohibitions on opium be rescinded, the hong merchants suggested that the ships would sail away if opium were readmitted as a medicine, as had been the custom under previous emperors:

As to the receiving ships in the outer waters, as the foreign merchants have only used them as opium stores, when opium is admitted into the port and a free traffic in it allowed, there will then be no further use for the receiving ships; and the foreign merchants should make them all spread their sails and return to their countries.<sup>7</sup>

The emperor decided not to relegalize opium. Instead he issued an edict received by Governor Tang on 14 July 1837 demanding that the foreign receiving ships should "quit their anchorage and all to

---

<sup>5</sup> Bridgman, *Chinese Repository*, vol. 7, p. 604 (MD).

<sup>6</sup> Slade (1839), p. 171 (GB).

<sup>7</sup> Slade (1839), p. 170 (GB).

return to their country."<sup>8</sup> Governor Tang then issued commands that superintendent Elliot should "give instant orders to the store-ships anchored off Lintin and other places to return to their country."<sup>9</sup> Wan, the controller-general of the Port of Canton, issued commands that the "perverse and traitorous foreigners", and others, who reside in the provincial city, should be expelled as well as their storeships now lying at Lintin."<sup>10</sup> The governor also demanded the naval commander-in-chief "instantly drive away the storeships from the anchorages of Lintin and Lantao back to their country."<sup>11</sup> On 20 November 1837 Tang gave Elliot a one-month deadline to "pay respectful obedience to the declared imperial pleasure, by sending off the various receiving ships anchored in the outer seas, requiring them one and all to return to their country."<sup>12</sup> The traders argued that the ships did not belong to them and on 22 December 1837 Tang warned that he would report their noncompliance to the emperor, "requesting orders that the trade may be stopped."<sup>13</sup>

### C. CONTRADICTIONARY EVIDENCE

The assertion that Lin wanted the fleet to simply sail away is also directly contradictory to the language in Lin's first edict to the foreigners of 18 March 1839. Here, not only did he rule out the option that the foreigners might say they would throw it into the sea, but he also promised to inflict capital punishment "if you craftily say you are going to take it to another country ...."<sup>14</sup> The Shuck translation is "falsely assert that you have taken it back to

---

<sup>8</sup> Slade (1839), p. 55 (GB).

<sup>9</sup> Slade (1839), p. 57 (GB), published in the *Canton Register* of 3 and 10 October 1837.

<sup>10</sup> Slade (1839), p. 65 (GB).

<sup>11</sup> Slade (1839), p. 66 (GB).

<sup>12</sup> Slade (1839), p. 69 (GB).

<sup>13</sup> Slade (1839), p. 71 (GB).

<sup>14</sup> Slade (1839), p. 29 (GB).

your respective countries ...."<sup>15</sup> Morrison uses "pretend craftily that you will carry it back to your own countries ...."<sup>16</sup>

The Sailing Away Tale is also contrary to Lin's reply on 29 March 1839 to Superintendent Elliot's request for servants, compradores and permission to leave Canton for Macao: "(H)ow, if the storeships should dare to sail away, you will be able to sustain the heavy criminality attaching to you?"<sup>17</sup> It is contrary to instructions given by the Cohong to the British merchants on 5 April 1839: "The empty receiving ships shall be all sent back to their countries."<sup>18</sup> More important, it is contrary to Lin's actions by issuing his edict to the foreigners of 18 March demanding the opium and following it immediately with instructions on 19 March given by the Hoppo forbidding the foreigners to leave, effectively holding them hostage at Canton until the opium should be delivered: "Pending the stay of the commissioner in Canton and while the course of his investigations, both to foreigners and natives, are yet uncertain, all foreign residents are forbidden to go down to Macao."<sup>19</sup>

#### D. DISCUSSION

The Sailing Away Tale in which Lin would have permitted the foreigners to simply depart with their opium originates in 1839 with warnings issued to the foreigners, but not from the Cohong, and not from Lin. It is what the foreigners hoped might happen. The British Chamber of Commerce was certainly interested in exploring this option, hoping to read such an intention into Lin's first edict of 18 March 1839. That the Cohong do not suggest it or subscribe to the idea can be seen from their noncommittal responses to the British questions.

The foreigners may have hoped for this, perhaps based on their past experience with Chinese edicts issued prior to the arrival of Lin. Governor Tang may have permitted, even demanded that the

<sup>15</sup> Shuck (1840), p. 94 (GB).

<sup>16</sup> *CR*, vol. 7, p. 613 (MD).

<sup>17</sup> Slade (1839), p. 68 (GB).

<sup>18</sup> Slade (1839), p. 74 (GB).

<sup>19</sup> Slade (1839), p. 42 (GB).

opium ships should depart in January of 1839 before Lin's arrival. The admiral and naval officers sent a delegation warning the ships to go even after Lin's arrival. The emperor, governor and other Chinese officials had all previously issued orders for the receiving ships to depart in 1837. No doubt the foreign traders initially hoped Lin's edict would be more of the same.

But Lin clearly intended to obtain the opium on the store ships located off the coasts of Macao and Hong Kong some eighty to a hundred miles distant; he had no intention of allowing the foreign ships to simply leave with their opium. This option of simply sailing away with the opium is explicitly ruled out by Lin in his first edict to the foreigners. He refutes this option in subsequent communications. His action of holding the foreigners hostage at Canton until they deliver the opium strongly contradicts the idea that he would ever have permitted the opium ships to simply sail away.

As with the Burning and Drowning tales, in the Sailing Away Tale something evil is made to disappear. Equivalent from a peculiar moral point of view, it certainly would not have been equivalent from the financial point of view of the British opium traders. Clearly they would have preferred to sail away with their opium if they had been given a choice.

Nor would it have been the same for Lin. Letting the ships sail away with their opium is not an option Lin intends to give the foreigners. Lin wants the opium surrendered. He wants the evil on board the store ships stationed on the seacoast to be transported up the Pearl River delta to the Bogue forts to be delivered into China. Why he wants it and what he intends to do with it is a separate issue but he does demand it repeatedly. He will not allow it to sail away. Lin *wants* the opium.

V  
THE ORIGINS OF THE BURYING AND  
PLASTERING TALES

---

- V. THE ORIGINS OF THE BURYING AND PLASTERING  
TALES  
A. LIN'S PROCLAMATION  
B. DISCUSSION

**B**OTH these tales begin with Lin's proclamation of late May or early June describing his new method for disposing of the opium, thereby fulfilling the emperor's instructions.

A. LIN'S PROCLAMATION

The Burying Tale begins with Lin's explanation of how he would destroy the foreign opium contained in a public proclamation issued in late May or early June. In the *Chinese Repository* he describes how he will dig trenches into which he will throw the opium: "There stone trenches will be opened."<sup>1</sup> Charles W. King used a slightly different phrase, "vats or trenches of stone to be prepared."<sup>2</sup> John Slade translates the phrase as "the excavation of a stone lined trench."<sup>3</sup>

---

<sup>1</sup> *CR*, vol. 8, p. 36 (MD).

<sup>2</sup> King, Charles W. "Imperial Edict respecting the Surrendered Opium, the Process of Destroying it, and etc. (Extracts from Letters of C. W. King, Esq. of Canton to J. Ballestier, Esq.)," *The London Times*, 1 November 1839, Issue 17188, column C, p. 2, found at [http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2\\_TTDA\\_2\\_\\_11/1/1839\\_\\_](http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2_TTDA_2__11/1/1839__); King italicizes *Hoomun*.

<sup>3</sup> Slade (1839), p. 110 (GB).



The Plastering Tale comes from the use of what both the *Repository* and King's letter refer to simply as "lime and salt" (italics added): "and *lime and salt* will be taken and mixed with the opium, until the drug is completely transmuted and destroyed;"<sup>4</sup> and, "in which to dissolve the opium with *lime and salt*."<sup>5</sup> Slade translates it more specifically as "mixed and stirred up with *unslaked lime and rock salt*."<sup>6</sup>

## B. DISCUSSION

Both the Burying and Plastering Tales also begin with Lin, specifically his bare-bones description of what he intended to do with the foreigners' opium contained in his public proclamation of late May or early June, 1839. Read it with the emphasis on the trenches and Lin is proposing to bury the opium. Read with the emphasis on the salt and lime, Lin intends to mix up a plaster, commonly used in the production of mortars, cements and Chinese century eggs.<sup>7</sup> Almost no foreigners and relatively few Chinese actually saw the process Lin used so it is easy to read either story into the brief description of the process contained in the proclamation. But neither burying nor plastering was what Lin had in mind for the opium extorted from the foreigners.

---

<sup>4</sup> *CR*, vol. 8, p. 36 (MD).

<sup>5</sup> King, Charles W. *The London Times*, 1 November 1839, <http://infotrac.galegroup>.

<sup>6</sup> Slade (1839), p. 110 (GB).

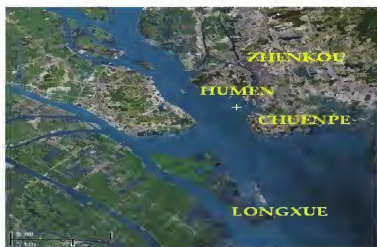
<sup>7</sup> See chapter nineteen for the recipe for century eggs.

## PART TWO HISTORY

---

AGAINST this background of what surely can be said to have *not* happened, the next story can be considered with more skepticism. Though generally accepted by historians who have carefully researched the period, this next tale also has several versions depending upon which writer or eyewitness account is thought to have the most credibility. Even so, these second and first hand depictions often contradict one another and can certainly be separated from the conclusions that are normally drawn from them.





## VI THE SALT, LIME AND WATER TALE

---

- VI. THE SALT, LIME AND WATER TALE
- A. 20TH/21ST CENTURY SECOND HAND ACCOUNTS
  - B. 19TH CENTURY SECOND HAND ACCOUNTS
  - C. SINOLOGIST'S REPORTS
    - 1. TAN CHUNG
    - 2. ARTHUR WALEY
    - 3. HSIN-PAO CHANG
  - D. DISCUSSION

LIN soaks the opium in lime, salt and water in this story, found in well-researched 19th and 20th/21st century accounts, the reports of those who have access to untranslated Chinese documents, and three accounts by those who actually saw what happened and left written descriptions of the process. Exactly how Lin soaked his opium makes for fascinating reading for two reasons: one, no one uses this method to try to destroy opium except Lin: it had never happened before and hasn't been done since, except by Lin, who in August 1839 constructed "a magnificent new tank specially designed for the purpose"<sup>1</sup> at Canton as well as other vats at the western pass of Canton<sup>2</sup> (though these may reference the same thing); and two, it shares so many similarities with a simple process used then and still used in the 21st century for extracting morphine from opium. It is worth the time to compare the various versions of this tale which have been circulating in three different centuries.

---

<sup>1</sup> Waley, p. 60.

<sup>2</sup> Shuck, p. 179 (GB).

## A. 20TH/21ST CENTURY SECOND HAND ACCOUNTS

Many of the better second hand accounts from this period get at least some of the important points correct. But each author has chosen to report certain details and excise others. Some emphasize the social aspects, some the exotic nature of the moment, some a horrible, instantaneous death. One or two are more careful but no one questions the odd nature of the process itself. The italics are added:

"Lin put an end to the blockade, took delivery of the opium, and personally supervised its destruction. It was *mixed with salt and lime, dissolved in water*, and flushed away into the sea;"<sup>3</sup>

"When Commissioner Lin finally started the destruction - by *salt and lime* in large rectangular ponds - of the 20,000 or so chests of opium on 3 June, he was visited by a group of foreigners who had asked to watch. Charles King and his party, including Charlotte, were there ...;"<sup>4</sup>

"The balls of opium, broken up, were thrown in a trench, then covered with two feet of *water*. *Quantities of salt and lime* were tipped in and the decomposing sludge stirred and drained off into a creek;"<sup>5</sup>

"As Lin sat in his shaded pavilion and supervised the daily destruction of huge quantities of drug in *sea-water ponds filled with lime ...*;"<sup>6</sup>

"The drug was thrown into *water-filled trenches* seven feet deep and 50 feet long. *Salt and lime* were added to the water to dissolve the opium, and the entire mixture was washed down a creek, and

---

<sup>3</sup> Inglis, Brian. The Forbidden Game. New York: Charles Scribner's Sons, 1975 found at [www.psychedelicalibrary.org/inglis.htm](http://www.psychedelicalibrary.org/inglis.htm).

<sup>4</sup> Hoe, Susanna and Derek Roebuck. The Taking of Hong Kong: Charles and Clara Elliot in China Waters. Richmond, England: Curzon Press, 1999, p. 82 (GB).

<sup>5</sup> Beeching, Jack. Chinese Opium Wars. London: Hutchinson, 1975, p. 84.

<sup>6</sup> Twitchett, Denis and Fairbank, J. K., editors. The Cambridge History of Modern China, vol. 10. London: Cambridge University Press, 1978, p. 188 (GB).

into the ocean. In a month, millions of dollars' worth of opium had been swallowed by the sea:"<sup>7</sup>

"He had three trenches dug, 150 feet long, 75 feet wide wide, seven feet deep at Hu-men on the Pearl River Delta .... The mixture was flushed into the sea before the unbelieving eyes of high Chinese officials and foreign merchants. They were impressed;"<sup>8</sup>

(T)he high commissioner had three shallow basins dug, each roughly fifty yards by twenty-five, with timbered sides and flagstoned bottoms. *Fresh water* was let into the basins. Across each ran wooden platforms: to these coolies brought the balls and cakes, broke them there by stamping upon them, and pushed the fragments into the water with their feet. *Lime and salt* were scattered on the surface, other coolies waded in and stirred vigorously with hoes and shovels, and at last the watery mess, stinking horribly, was allowed to run into the creek and out to sea with the tide. ... King and Bridgman went to see for themselves ... 1600 chests were destroyed the day of their visit;<sup>9</sup> and,

Mr. King ... he and his wife and Captain Benson ... of the vessel on which he had come, were conducted by Liu, a captain, to the scene of operations, which was on the bank of a creek. They saw an area surrounded by a bamboo fence in which were three trenches, 150 feet long, 75 feet broad and 7 feet deep, flagged with stone and lined with timber. The process of destruction was this: the trenches were first filled with *water* piped from a stream to the depth of two feet. Planks were put across, and coolies emptied baskets of opium into the trenches, while other coolies standing in the water mixed the opium thoroughly with it. After this, more coolies arrived *with salt and lime* and tipped them into the mixture, which was further churned. After a time this caused the opium to decompose when it was drained off by a sluice into the creek. Mr. King observed the extreme care that was taken to avoid any leakage of opium. ... While he was there, one man was caught with a small quantity of the drug and instantly decapitated.<sup>10</sup>

<sup>7</sup> Tamura, Eileen, et al. China: Understanding its Past. Honolulu: University of Hawaii Press, 1998, p. 98 (GB).

<sup>8</sup> Salisbury, Harrison E. China: 100 Years of Revolution. Found at <http://ias.berkeley.edu>.

<sup>9</sup> Fay, Peter Ward. The Opium War: 1840-1842. Chapel Hill, NC: University of North Carolina Press, 1975, p. 160.

<sup>10</sup> Collis, Maurice. Foreign Mud. New York: Alfred A. Knopf, 1947, p. 219 (GB), p. 231 in paper.

One account has the dates off by two months: "The opium was in fact meticulously destroyed, most of it during the four week period starting on 3rd April and the remnant in May."<sup>11</sup>

The previous second hand reports give a reasonably good idea of the process but all have left out important and significant details when they have not got the details completely wrong.

## B. 19TH CENTURY SECOND HAND ACCOUNTS

Some of these get it at least half right. Sometimes the lime is reported as quick-lime. Seawater replaces fresh. The confusion between seawater and fresh water with added salt may seem trivial. But Guangdong is a maritime province. Lin had been a salt controller. One method of making salt uses ponds constructed on the seacoast into which seawater is channeled at high tide. Lin could have dumped the opium in such salt ponds but he chose not to. He constructed new vats on the bank of a stream and brought fresh water to them instead. Chapter twenty-one will provide some clues as to why. The number of chests also varies. Only one found it "curious." The italics are added:

"Many questions arose as to how it was to be disposed of, but at last Lin himself hit upon the clever expedient of destroying it by *lime and oil*, in pits dug for the purpose, and then pouring the fluid compound into the sea. *The process was a curious one ...*;"<sup>12</sup>

"(F)or the opium, instead of being made profitable to official pockets ... was converted into a kind of brown, fetid mud by the agency of *salt, lime and water* and was then sluiced into the river;"<sup>13</sup>

"(S)ome 23,283 chests, which Lin destroyed with *quick-lime*;"<sup>14</sup>

---

<sup>11</sup> Le Pichon, Alain. China Trade and Empire. Oxford, England: Oxford University Press, 2006, p. 357 (GB).

<sup>12</sup> Bernard, William Dallas. Narrative of the Voyages and Service of the Nemesis, from 1840-1843, vol. 1. London: Henry Colburn, 1844, p. 206 (GB).

<sup>13</sup> Dickens, Charles. Household Words: A Weekly Journal, vol. XVI. New York: John Jansen's Co., 1858, p. 184 (GB).

<sup>14</sup> Train, George Francis. An American Merchant in Europe, Asia and Australia. New York: G. P. Putnam and Co., 1857, p. 90 (GB).

"During the month of June every chest of this enormous amount was destroyed by decomposing it in vats filled with *lime, salt and water*;"<sup>15</sup>

"(D)escribed by an eyewitness ... by mixing it in parcels of 200 chests in trenches, with *lime and salt water*, and then draining off the contents into the adjacent creek at low tide;"<sup>16</sup>

"(L)arge trenches, lined with stone, were dug, the opium being decomposed by the use of *quicklime, rock salt, and water*, when the mixture was allowed to run into the sea;"<sup>17</sup> and,

Our countryman, Mr. King, who is sneeringly called in the British publications, "the American anti-smuggling merchant," witnessed the destruction of the opium. Three vats of perhaps 75 by 150 each were made, into which it was thrown and mixed up with *unslacked lime and rock salt*, until it became a fetid mud, when sluices were opened and the vats emptied into the river. The work was faithfully performed ....."<sup>18</sup>

The Prussian missionary-translator-doctor-military governor-adventurer-scalywig Karl Gutzlaff claimed that it had been only nominally destroyed but did not leave any further clues (italics added): "(A)nd the immense quantity thus obtained was *nominally* destroyed."<sup>19</sup>

### C. SINOLOGIST'S REPORTS

All of the previous accounts from the 19th and 20th/21st centuries are hearsay, as-told-to, second hand reports. Not one of the authors was there, on the scene. No one actually witnessed

<sup>15</sup> Shuck, Jehu Lewis. Portfolio Chinensis: A Collection of Authentic Chinese State Papers. Macao, China: Shuck, 1840, p. xvi (GB).

<sup>16</sup> Williams, Samuel Wells. The Middle Kingdom, vol. II. New York: Wiley and Putnam, 1848, p. 518 (GB).

<sup>17</sup> Bingham, J. Elliot. Narrative of the Expedition to China, vol. II. London: Colburn, 1843, p. 100 (GB).

<sup>18</sup> Edmonds, John W. Origin and Progress of the War Between England and China. New York: Newburgh Lyceum, 1841, p. 14 (GB).

<sup>19</sup> Gutzlaff, Karl F. The Life of Taou-kiang, Late Emperor of China. London: Smith, Elder and Co., 1852, p. 160 (GB).



anything. The better ones have done good research but one has a right to distrust hearsay simply because it is hearsay.

However, there are some authors and historians who have access to original, untranslated Chinese documents. Of these, a few have done extensive work on the period in question. Their views must carry special weight. The three most careful are Hsin-pao Chang, Arthur Waley, and Tan Chung, but even they disagree with one another over number and dimensions of the tanks, time and means of arrival of the foreigners, access to observers, who observed, the process itself and even location (in part because the eyewitness accounts also differ) and they are not, of course, immune to personal bias.

#### 1. DR. TAN CHUNG'S ACCOUNT

Chung chooses by and large to follow Lin's account (*italics added*):

After repeated consultations with his colleagues and experts, Lin decided to construct two huge tanks of 150 Chinese feet in both length and width. The bottom of the tank was paved with stones and the four sides were fitted with wooden planks to prevent any leakage. The tanks were constructed on the sea coast at a considerably high altitude. One side of each of the tanks was connected with a ditch so that *water* could flow into it. The other side was linked with a creek which could clear the contents of the tank into the sea. The site was enclosed by high wooden fences to keep away spectators. Tents were erected in the middle of the site for officials to supervise the operations. Destruction began by filling water into the tank, after which *salt* was thrown into the tank to make a solution. Then the opium chests were opened under close supervision. Every opium cake was cut into four pieces and thrown into the tank. It was then soaked in the solution for five to six hours. After that, *lime powder* was thrown into the tank. *The opium immediately got burnt, and the solution boiled.* Then labourers with iron shovels and wooden rakes stood on springboards over the tank and stirred the mixture in order to decompose the opium completely. When the tide was receding, the decomposed content was let off through the creek and followed the receding tide into the ocean. Then, fresh water was let into the tank, and its bottom was thoroughly washed so that not a single drop of the solution remained. When one tank was waiting to be cleaned, the second tank would be used for starting the process

of destruction. In the beginning, only three to four hundred chests were destroyed in this manner. After some days, the speed increased to eight hundred to one thousand chests a day. The destruction was daily supervised by the high mandarins at Canton. A few Americans C. W. King and his wife, Rev. E. C. Bridgman and Captain Benson, also witnessed the spectacle.

Lin, who was the chief witness of the destruction, described the spectacle thus: *'When it (opium) was being dissolved, a thick layer of oil surfaced, while the residue sank to the bottom. A gust of foul smell rose which made one feel unbearable. At that moment, I realized that how this stuff could so much captivate people's minds, shorten their life-span and turn them into skeletons.'*

Thus, so much poison which would feed about three million addicts for a whole year was sent back to the sea from where it had come, without allowing it to reach an addict. If this quantity of poison had reached the interior of China, how many lives would have been destroyed and how many families ruined."<sup>20</sup>

## 2. ARTHUR WALEY'S ACCOUNT

Waley, curiously, says very little about the actual process which Lin used. He does not mention the lime and salt. He is primarily interested in quoting from Lin's diary to describe the preface to the coming war. Direct quotations from the diary he places between single quotes but in at least one such entry, he summarizes instead of quotes, though not particularly inaccurately. Some good information is available as he follows Lin's entries:

"On May 13th, after offering incense at dawn to the Queen of Heaven, 'I took the opportunity of inspecting the trenches that are being made to drain off the opium when it is destroyed;'"<sup>21</sup>

On May 19th Lin composed an 'Address to the Spirit of the Sea', to be used when making a sacrifice of apology to the Spirit for polluting the sea with the opium that he now proposed to liquefy and run off into the Canton estuary. 'If it had been cast into the flames, the charred remains might have been collected. Far better to hurl it into the depths, to mingle with the giant

---

<sup>20</sup> Chung, Tan. China and the Brave New World. Durham, NC: Carolina Academic Press, 1978, pp. 199-200.

<sup>21</sup> Waley, Arthur. The Opium War through Chinese Eyes. Stanford, CA: Stanford University Press, 1958, p. 42.

floods.' I tell you this, Lin explains, in order that you may warn your watery subjects in due time to keep away;<sup>22</sup>

"Early this morning,' he writes on June 1st, 'I sacrificed to the Sea Spirit, announcing that I should shortly be dissolving opium and draining it off into the great ocean and advising the Spirit to tell the creatures of the water to move away for a time, to avoid being contaminated. After I got back to my lodging-place it rained all day;'"<sup>23</sup>

"On June 3rd the destruction of the opium began, and from now onwards he records day by day the quantity disposed of, just as in previous weeks he had recorded the quantity surrendered;"<sup>24</sup>

On June 13th he sent to the Emperor an account of the way in which the opium was being destroyed. This, like the delivery, required an immense amount of meticulous organization. Only the most trusted of his subordinates were used as superintendents of the work, and the coolies employed were stripped and searched when they knocked off from work each night. He tells the Emperor that the stench of foreign opium is atrocious; the idea that the foreigners do not simply scrape off the thickened juice and decoct it, but also use some 'strange and vile' process, is evidently true;<sup>25</sup>

'The inhabitants of the coastal region', Lin informs the Emperor, 'are coming in throngs to witness the destruction of the opium. They are, of course, only allowed to look on from outside the fence and are not permitted access to the actual place of destruction, for fear of pilfering. The foreigners passing by in boats on their way up to Canton and down to Macao all get a distant view of the proceedings, but do not dare to show any disrespect, and indeed I should judge from their attitudes that they have the decency to feel heartily ashamed;'<sup>26</sup> and,

The entry for June 17th is: 'A fine day. Yesterday the American merchant King and others sent a note to Major Yang Ying-ko saying they had seen a proclamation announcing that orders had been received for the destruction of

---

<sup>22</sup> Waley, pp. 44-45.

<sup>23</sup> Waley, p. 46.

<sup>24</sup> Waley, p. 47.

<sup>25</sup> Waley, p. 49.

<sup>26</sup> Waley, p. 49.

the opium on the spot and that foreigners were to be told that they might witness the destruction and obtain information about it. These people asked for permission to come and look, which I at once granted. This morning at the Hour of the Snake (9 a.m.) the foreigner King, with some ladies in his party, and also Bridgman, Captain Benson and others arrived in a small boat and were then brought in one of our war-junks to the Bogue. From a point above the destruction-tank they watched the melting of the opium, and then came to my pavilion, where they saluted me in the foreign way by touching their hats. One of my staff then conveyed to them suitable instructions and warnings, and after they had been given a present of things to eat, they retired. Today we melted 1,600 chests of "Company" opium.<sup>27</sup>

### 3. DR. HSIN-PAO CHANG'S ACCOUNT

Chang has even more access to Chinese documents than either Chung or Waley but he chooses to follow, mostly, Bridgman's eyewitness report published in the *Chinese Repository*, supplying background information from Lin's diary. This is curious because Chang generally has enormous respect for Lin (it is impossible not to) but chooses the account of the Western missionary-publisher as the most likely (*italics added*):

The destruction work commenced in the hours of *wei* (1-3 P.M.) on June 3 and lasted until nightfall. ... The method of destroying the opium was determined after extensive inquiry. Lin and his associates decided to disintegrate it by mixing it with *salt and lime*. They had three trenches dug at the village of Chen'ou, each about one hundred fifty feet long, seventy-five feet wide, and seven feet deep, and lined with flagstones on the bottom and heavy timber on the sides.<sup>28</sup>

At this point Chang, like Shuck, provides a footnote to explain an anomaly in the text: "There is a mysterious discrepancy regarding the number and dimensions of the trenches. Lin's report, dated June 13, stated that he built two trenches, each measuring

---

<sup>27</sup> Waley, p. 50.

<sup>28</sup> Chang, p. 173, *italics* Bridgman for *wei*, recorded as in the original.

approximately over 150 by 150 *ch'ih*; whereas Bridgman and King, who carefully inspected the work, give different data."<sup>29</sup>

Even though it was Lin who constructed the tanks, and Lin throughout shows himself to be both capable and careful of detail, Lin's account receives here only a footnote. Chang continues the story (*italics added*):

The opium balls were first broken into pieces and then thrown into a trench, which was filled with two feet of fresh *water*. *Salt and lime* were scattered profusely over it. Laborers with hoes and shovels stirred and turned the mixture while the opium slowly dissolved. When the drug was completely decomposed, the *liquid was made to flow through screens* (to prevent the escape of any large lumps of opium) to the nearby creek which carried it to the ocean.

Large crowds were attracted to the scene, but no unauthorized persons were allowed to enter the palisade. Any workman leaving the site was subjected to a careful search. The opium was stored in small enclosures within the compound and before any chest or bag was disposed of, it was checked to make sure that it bore the markings made on it when taken from the British store-ships. Altogether, more than ten Chinese made attempts to steal some of the drug, but none succeeded. On June 19, several thieves were caught, and the strong police force was further reinforced. One man caught trying to carry off a small portion of opium was executed immediately. ... On July 5, Lin and his colleagues dispatched a memorial to the emperor reporting that a total of 2,376,254 catties of opium received from the British had been destroyed by June 25. ... The memorialists also stated that among the many spectators were a few Americans, Mr. and Mrs. King, Reverend Bridgman, and Captain

---

<sup>29</sup> Chang, p. 267. The *ch'ih*, or Chinese foot, like the *li*, or Chinese mile, seems to have varied by time and place. Further, the number of *chi* per *li* varied also. Today, one *chi* is fixed at 33.3 cm or 1.094 feet and one *li* equals 1500 *chi* or 500 meters or 546.8 yards, according to the wikipedia at <http://en.wikipedia.org>. Shuck adds a note on page 181 of the *Portfolio Chinensis*: "It requires about three and a half *Le*, to make an English mile." The translator of Lin's second letter to the queen in the *Canton Register* adds a note to Lin's "sixty or seventy thousand miles" explaining: "That is, Chinese miles - from twenty to twenty-three thousand British Statute miles." Bingham says, "About three *le* are equal to one English mile (p. 41)." If we accept three to three and one-half *li* per mile, and 1500 *chi* per *li*, then Lin's tanks would have been somewhere between 150 to 180 feet on each side.

Benson, who, when watching the opium balls being cut into quarters, stamped into pieces, and *spread with salt and lime*, frequently nodded their heads and covered their noses to ward off the fetid odor.<sup>30</sup>

#### D. DISCUSSION

Second hand accounts by nonspecialists and even some good historians do not always get the details correct. Often these descriptions are supplemented with bad odors, sudden executions and foreigners astonished at the sheer waste of so much wealth. But in the accounts by the sinologists, there are four details not always mentioned that will be important later: the long soaking, screens on the exit of the tanks, the separation of the opium into a floating oil and a sinking residue, and a settling time. Unfortunately, although it makes for a better story, the opium was not cut into four pieces, not thrown, not into square tanks which were neither filled with seawater nor oil, nor were the tanks located at a high altitude. But these are all second hand reports, good, well researched, but what authors who weren't there say Lin did.

In the Burning Tale, the evil was purified by fire, much as one must cleanse witchcraft. Sometimes the opium was set on fire, sometimes it was the opium ships anchored in the Pearl River Delta that were set on fire. Often the opium was burned at night in a gigantic bonfire just to increase the potency of the imagery. Even the still warm ashes of the evil were themselves still partaking of so much evil they also then needed to be scattered into the rivers or the sea. In the Drowning Tale, the evil was sunk into the Canton bay or the waters off Hong Kong. Again, there is the dramatic imagery of an opium Titanic settling beneath the waves, perhaps only one or two chests bobbing to the surface to mark its watery grave. In the Sailing Away Tale, the evil was made to magically disappear upon the word of a great and noble master. In the Burying and Plastering Tales the evil was buried deep out of sight in the bowels of the earth or mixed into a thick paste that was then somehow and very illogically burned or drowned or sluiced into the rivers or the sea.

---

<sup>30</sup> Chang, pp. 173-174.

By contrast, in the Salt, Lime and Water Tale evil is neither purified by fire nor cast into the depths nor cast out upon the vast ocean nor buried deep below the surface of the earth. Instead, it is transformed horribly and justly into something wretched and putrid which is then expelled from large tanks much like filthy brown feces are purged from the body. The lime and salt in the story are being used only to help purify the evil, just as were the fire and water. Perhaps by reason of its earthy imagery, it is not as popular as the Burning or Drowning Tales. It is more complex and less graphically interesting than fire or drowning but the effect is the same: a great evil is finally overcome so that purity and goodness may triumph.

VII  
THE OFFICIAL ORIGINS OF  
THE SALT, LIME AND WATER TALE

---

- VII. THE OFFICIAL ORIGINS OF THE SALT, LIME AND WATER TALE
- A. THE OLD METHOD OF FIRE AND WUTUNG OIL
    - 1. OLD METHOD NOT MENTIONED
    - 2. OLD METHOD DESCRIBED
  - B. THE NEW METHOD OF SALT, LIME AND WATER
    - 1. NEITHER METHOD MENTIONED
      - a. COMMUNICATIONS TO THE FOREIGNERS
      - b. COMMUNICATIONS TO THE CHINESE
    - 2. NEW METHOD DESCRIBED
  - C. THE EMPEROR'S INSTRUCTIONS
  - D. THE REASON GIVEN FOR THE CHANGE OF METHOD
  - E. DISCUSSION

AS with most of the other tales of what happened to the opium, this one also begins with Lin. Specifically, it begins with Lin's official proclamation of late May or early June 1839 in which he describes publicly how he will dispose of the foreign opium he has received. This proclamation contradicts his edict of 18 March 1839 in which he stated that he would burn the foreigners' opium. In this new proclamation he offers a change from the traditional method of fire and wutung oil.



## A. THE OLD METHOD OF FIRE AND WUTUNG OIL

The traditional method for disposing of opium in China used fire and wutung oil. As late as 1838, this is the method described in some of the memorials to the emperor. But only a few official Chinese documents from the period before Lin's arrival at Canton mention what should be done or what was done with confiscated opium. Most do not consider the issue, simply assuming any opium will in some manner be disposed of by the authorities. For the purpose of providing context, it is important to be understand what was *not* said.

## 1. OLD METHOD NOT MENTIONED

Many well-argued memorials (letters, or position papers) were sent to the Emperor in the 1830s suggesting solutions to the problem of the outflow of silver. Of the memorials that supported the prohibition of opium, few contained suggestions as to what to do with the opium that would then be received into the hands of government officers.

Dr. P. C. Kuo of Harvard University "selected and translated a number" of documents from the *Ch'ou Pan Yi Wu Shih Mo* (Reign of Tao-kuang, The Beginning and End of the Management of Barbarian Affairs) published in 1930. Some he only excerpts and some he translates in full. From the excerpts: Yuan Yu-lin, a censor of the Kiangnan circuit, opposed the proposals for the legalization of opium in 1836 but did not specify what to do with the contraband discovered;<sup>1</sup> Teng Ting-chen, the Governor-General of Liang-Kwang confiscated opium in 1837 but never says what he did with it;<sup>2</sup> Chingopu, Governor of Shantung, asked for stronger punishment of smugglers and officials "who fail to detect the importation" of opium in 1838 but does not consider what to do with the opium itself;<sup>3</sup>

---

<sup>1</sup> Kuo, P. C. A Critical Study of the First Anglo-Chinese War with Documents. Taipei: Ch'eng Wen Publishing Co., 1970, a reprint of the edition "originally published in Shanghai in 1935," pp. 211-214.

<sup>2</sup> Kuo, pp. 214-215.

<sup>3</sup> Kuo, pp. 218-219.

Chang Yo-sung, Acting Governor of Hupeh, suggested exile and banishment for smokers and dealers, strangulation for the owners of opium divans and the harassment by Chinese junks of the English receiving ships;<sup>4</sup> Chien Pao-sheng, Governor of Hunan, thought dealers should "be made subject to a penalty greater than strangulation" but does not state what this could be;<sup>5</sup> Shen Chi'hsien, Governor of Shansi, supported severe punishments and heavy convictions;<sup>6</sup> and Kueiliang, Governor of Honan, stated that the "contraband goods in their ships should be sent to the authorities."<sup>7</sup> In none of these selected excerpts is there any suggestion as to what the authorities should do with surrendered or confiscated opium.

## 2. OLD METHOD DESCRIBED

In at least two documents that Kuo translates from the period before the war, there are specific suggestions as to what should be done with any opium or opium pipes received or confiscated. Chou T'ien-chueh, Director General of the Grain Transport, offered this idea in 1838 (*italics added*): "When an offender is discovered, his opium properties should be plastered with *wutung*-oil and sent to the authorities to be *destroyed*."<sup>8</sup> The online CBYWSM (TK) reads for destroyed, *xiao* (first tone, CFB, 8912.7), *hui* (third tone, FHGE, 9784.7). The first is defined as "melt, fuse, market, sell" and the second, "blaze, destroy by fire." Together, they can be read literally

---

<sup>4</sup> Kuo, pp. 227-229.

<sup>5</sup> Kuo, pp. 231-232.

<sup>6</sup> Kuo, pp. 78-79.

<sup>7</sup> Kuo, pp. 232-234.

<sup>8</sup> Kuo, p. 230. Wutung oil can be obtained from the seeds of the wutung or Chinese parasol tree (*Firmiana simplex* L.). Also known as *Sterculia platanifolia* L., sometimes called the "varnish tree" and similar to the tung tree, *Aleurites cordata* L. (*t'ung-yu-sha*), also given as *Aleurites fordii* Hemi L. From "*Firmiana simplex*, Chinese parasol tree" by E. F. Gilman and D. G. Watson, Fact Sheet ST-259, Nov. 1993, USFS at <http://hort.ufl.edu/trees/firsima.pdf> and "Tung Blossom Festival Kicks Off," by Debbie Wu writing for the *Taipei Times*, 20 April 2003 found at [www.taipeitimes.com](http://www.taipeitimes.com).

as "destroy (by melting or burning)" and by extension simply "destroy."<sup>9</sup> In the context of the wutung oil, it can be argued that Chou T'ien-chueh means the opium should be destroyed by burning.

Lin Tse-hsü, then Governor-General of Hu-kuang, wrote three memorials to the emperor on the outflow of silver before he became commissioner. He also connected the disappearance of silver to the importation of opium and suggested what should be done and what was done with any confiscated Chinese opium.

Mentioned briefly in chapter three, the first memorial, received 10 July 1838, was very specific (*italics added*): "All the opium surrendered ought to be destroyed in the presence of the due authorities, *burning it with wutung-oil* and then throwing it away into the rivers." The Chinese character in the online original is *shao* (first tone, FGGU, 9481.1), literally, "burn or bake" and he does not throw the opium into the river but its ashes, using *hui* (first tone, KF, 7128.9) meaning "ashes, dust, mortar, or lime."<sup>10</sup> Later, in the same memorial, Lin suggests (*italics added*):

I therefore propose that they should be required to surrender all the smoking instruments they have made, within one month after the proclamation of the order, to be *destroyed* by the authorities.<sup>11</sup>

Kuo translates "destroyed" but the online original uses the character *hui* (3) containing *huo* (3), meaning literally, "blaze, destroy by fire."<sup>12</sup> Given the previous context of the wutung oil, "burned by the authorities" might be a more precise translation.

The second memorial, received 5 October 1838, says that is exactly what he did with 12,000 taels of opium and paste and 1,264 pipes (*italics added*):

<sup>9</sup> CBYWSM (TK), Volume 3, page 12a, lines 5 and 6, found at [www.cadal.zju.edu.cn/Reader.action?bookNo=02024398](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024398); definitions according to [www.mdbg.net](http://www.mdbg.net), [www.tigernt.com](http://www.tigernt.com), and [www.mandarintools.com](http://www.mandarintools.com).

<sup>10</sup> Kuo, p. 224, see appendix C; CBYWSM (TK), volume 2, page 24a, line 3, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024397](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024397).

<sup>11</sup> Kuo, p. 225.

<sup>12</sup> CBYWSM (TK), volume 2, page 24b, line 2 from [www.cadal.zju.edu.cn](http://www.cadal.zju.edu.cn).

I had, before my last departure from the provincial capital, led two officers to examine carefully what had thus been collected, and then broke them with a sword and *burned them by fire*. There were a great many beautiful opium-bowls and ingenious designs. In case the oily matters dropped down in this process of destruction, we mixed them with *wutung*oil, thoroughly burned them, and threw them away into the midst of the rivers.<sup>13</sup>

Clearly, both Lin and Chou T'ien-chueh in these passages written in 1838 are *burning* confiscated opium with fire and *wutung* oil. The purpose of the oil is to help the fire completely burn the opium into an ash which is then thrown into the rivers.

## B. THE NEW METHOD OF SALT, LIME AND WATER

Before considering Lin's new method of using salt, lime and water, again it is equally important to notice what was *not* said.

### 1. NEITHER METHOD MENTIONED

Both before and after his decree of 18 March 1839 declaring his intention to burn the opium of the foreigners, Lin has much communication with both the foreigners and the Chinese of Guangdong province until he makes his final proclamation on the subject in late May. Yet it is difficult to find examples in these documents during this interim where Lin describes what he will do with any opium received.

#### a. COMMUNICATIONS TO THE FOREIGNERS

Lin does not appear to refer again to burning the opium (or to salt and lime) in correspondence with the foreign merchants until he changes his method some two and a half months later. It is impossible to be sure that he *never* refers to the burning again in communications to the foreigners without examining *all* such

---

<sup>13</sup> Kuo, p. 81; one *tael* equals 1.333 ounces (about 38 grams) so Lin is reporting here that he burned roughly 1000 pounds or 450 kilograms of opium with *wutung* oil when he was governor of Hu-kuang; see appendix C.

communications. But it is curious that in so many of his later communications he no longer speaks of the burning of the opium or any other method of disposal to the foreign merchants after this first edict. Instead, he says only that he wants it *delivered up* or *surrendered*. Further, when Lin refers to his original edict of 18 March 1839 in these communications he mentions only that he had demanded the delivery or surrender of the opium, not that it was to be delivered or surrendered to be burned.

For example, in a second edict written to the foreigners and dated 26 March 1839, Lin offers four reasons why the foreigners should surrender their opium but he does not say what he intends to do with it. There were also various translations of this second edict. Dr. Chang pointed out a number of errors in Morrison's and the other translations: "(t)he main ideas were imparted to the foreign community, but, judging from the English versions, the undertones were not fully communicated."<sup>14</sup>

John Slade (1839) published a translation by a Mr. Thom, frequently used as an interpreter by the British Chamber of Commerce (italics added):

Proclamation from H. E. the high Commissioner Lin, desiring foreigners speedily to *deliver up* their opium; under four heads, or for four reasons. First. - Ye ought to make haste and *deliver* it up, by virtue of that reason which heaven hath implanted in all of us. ... If, however, ye will now repent and *deliver up* your opium, by a well timed repentence, ye may yet avert judgment and calamities .... Secondly. You ought to make immediate *delivery* of this opium in order to comply with the laws of the land. ... I wish nothing more than that ye *deliver up* all the opium you have got ... which I desire may be entirely *surrendered* to the mutual advantage of all .... And still will ye refuse to *deliver up* your opium? Which is the way to preserve your lives? ... Thirdly. You ought to make immediate *delivery* of this opium by reason of your feelings as men. ... What better plan, then, than at once to *deliver up* your opium, and to reap enjoyments and rewards by so doing! ... Fourthly. - You ought to make a speedy *delivery* of your opium by reason of the necessity of the case. ... If you do not *deliver* it up to the government, pray what will be

---

<sup>14</sup> Op. Cit., Chang, pp. 143, 261.

the use of keeping it on hand? And having once made the *delivery* of it, your trade will go on flourishing more abundantly than ever!<sup>15</sup>

Shuck (1840) also published his own more literal translation of the same edict (*italics added*):

Lin, high Imperial Commissioner of the Celestial Court, issues his commands to the foreigners, and lays before them four reasons why they should speedily *deliver* up their Opium. First Reason. It is in accordance with the principles of heaven that the *surrender* be immediately made. ... And yet, if your will, at the present time, make the *surrender*, you may possibly, by your repentance, avert the portending vengeance. ... Second Reason. It is in accordance with the national laws that you should make the *surrender* without delay. ... My only wish is that you may make an entire *surrender* of all your Opium .... Merely take the remaining quantity which you have at present on board your store-ships and *surrender* up the entire amount of it, which will be greatly to your advantage. ... But do you still not reflect upon the subject of making a speedy *surrender* of your opium in order that you may escape this threatened loss of your lives? ... Third Reason. You ought at once to make the *surrender* because it is in accordance with the natural feelings of mankind. ... (W)hy not, therefore, make a *surrender* of your Opium, and obtain handsome rewards. ... Fourth Reason. The force of circumstances evince that you ought to hasten to make the *surrender*. ... (A)nd what difficulty would there be, and what regret would be occasioned, in *giving it up*? ... (A)nd if you do not *surrender* it to the custody of the mandarins, of what use will it be to your to retain it? And immediately after it has been *surrendered*, your legitimate commerce shall more abundantly flourish ....<sup>16</sup>

In neither of these translations is there any mention of what will be done with any opium that will be delivered up or surrendered.

Similarly, on 26 March 1839 Lin replied to King's letter exonerating himself from all involvement with the opium traffic (*italics added*):

On my arrival in Canton, I heard that the said foreigner, King, never trafficked in opium; of all he is the most praiseworthy; but when I, the great minister, early promulgated my decree, requiring all the foreigners to *deliver*

<sup>15</sup> Slade (1839), pp. 60-62 (GB).

<sup>16</sup> Shuck (1840), pp. 100-101, 103, 107-110, 114, 116-117 (GB).

up their opium to government, why was not the said foreigner able quickly to induce them to do so? Yesterday, because many days had elapsed without any report of its being *delivered* up, the holds of the ships were in due course closed .... If they really act thus, and immediately *deliver* up all their opium, then what difficulty can there be in having business go on in its usual course? But at the present time all the foreigners have not *delivered* up all their opium .... I give instructions to the prefect of Kwangchow, that he may direct the hong merchants clearly to explain this edict, that he (King) may early induce all the foreign merchants to comply and *give up* their opium without delay ....<sup>17</sup>

Again, Lin refers to the delivery of the opium but not its final disposition.

On the 27th of March, Lin replied to a message from superintendent Elliot. In this he refers to his edict of 18 March 1839 as requiring only that the opium be surrendered, not surrendered to be burned (*italics added*):

Therefore did I first issue an edict requiring the *delivery* up of the opium. ... I heard that all the foreigners verbally expressed their readiness to *deliver* up opium, and only failed to state the true amount ... the orders that have been given to *deliver* it up ... the foreigners to obey the orders, requiring them to take the opium on board the store-ships, and speedily *deliver* it up ....<sup>18</sup>

On 1 April 1839, the commissioner replied to an answer given by the U. S. consul, Snow to his original edict of 18 March 1839 (*italics added*):

This coming before me the commissioner, &c., I, as is proper, reply. - I find on examination, that the American nation ought to *deliver* up some opium .... It is of the greatest importance that the opium be *delivered* up .... Let the said consul, Snow, forthwith hand up, in a responsive petition, a clear and detailed account of the quantity &c., to be *delivered* up ... (American property) which the said consul, Snow, must hand up in a responsive petition, and forthwith *deliver* up the opium.<sup>19</sup>

<sup>17</sup> Slade (1839), p. 58 (GB).

<sup>18</sup> Slade (1839), pp. 64-65 (GB).

<sup>19</sup> Slade (1839), pp. 59-60 (GB).

Again, there is no mention of what will be done with any opium surrendered.

b. COMMUNICATIONS TO THE CHINESE

Similar language is found in edicts both to the Chinese of Guangdong province and to the Chinese Cohong merchants. Again, Lin demands only the surrender of the opium, not describing what he intends to do with it once received. Any reference to his edict of 18 March 1839 only states that he demanded the surrender of the foreigners' opium, not that he intended to burn it.

In an early and separate edict to the Chinese of Guangdong province, Lin does not describe what he will do with surrendered Chinese opium but Shuck (1840) suggests what he finally did.

On 15 March 1839 Lin issued a long, detailed and extensive series of prohibitory regulations to the Chinese of Guangdong province, demanding they surrender their pipes and other implements. As for their opium, he commands them only to (*italics added*) "take their opium both crude and prepared, and voluntarily *deliver it up* to the officers."<sup>20</sup>

Attached to this was another edict from "Lew, by special appointment chief mandarin of the Nanhæ district" who writes (*italics added*):

I have just received orders from their Excellencies the High Imperial Commissioner, the Governor and the Lieutenant-Governor embodying their joint directions for the opening of a public depot, and officially to appoint officers to receive the *surrendered* Opium both crude and in its prepared state. I have already deliberately requested that this public depot might be established within the precincts of the western pass, near the temple of longevity.<sup>21</sup>

Shuck (1840) adds a note to this paragraph: "The *Se-kwan*, *western pass*, is in the western suburbs of Canton city, where vats

---

<sup>20</sup> Shuck, p. 59 (GB).

<sup>21</sup> Shuck, p. 80 (GB).



were dug during 1839 for destroying opium."<sup>22</sup> Waley has Lin later witnessing "the destruction of 20,000 catties of opium in a magnificent new tank specially designed for the purpose" on 13 August 1839.<sup>23</sup> Fay also says that in 1839, "such quantities of the drug were coming into his hands that he had a special destruction-basin built right in Canton."<sup>24</sup>

Whether Waley's or Fay's single tank is one of Shuck's vats at the western pass is unclear but these details do indicate that Lin applies his new method not simply to the foreign opium but to confiscated Chinese opium as well. Shuck is probably *not* referring to the tanks at Chunhow constructed for the foreign opium since these are considerably east and south of the city of Canton, not west. Regardless of Shuck's source of information, Lin does not say in this edict to the Chinese what will become of their surrendered opium.

In case either the foreigners or the Chinese merchants might be in any doubt about his intentions, Lin issued another edict dated 17 March 1839 to the Cohong monopoly with which the British did business in Canton.<sup>25</sup> In this edict Lin demanded that the Hong merchants repeat his commands in person to the foreign traders as to the surrender of their opium and the signing of the bonds. But in the several translations of this first edict to the Chinese merchants Lin makes no reference that he has told the foreigners he will burn their opium; he merely states that he has given orders to the foreigners to *surrender* their opium, without saying anything further about its eventual disposition (*italics added*):

The utter annihilation of the opium trade being now my first object, I have given commands to the foreigners, to *deliver up* to government all the myriads of chests of opium which they have on board their warehousing vessels. And I have also called on them to subscribe a bond, in Chinese and in the foreign

<sup>22</sup> Shuck, p. 179 (GB), *italics Shuck*.

<sup>23</sup> Waley, p. 60.

<sup>24</sup> Fay, p. 172.

<sup>25</sup> Slade (1839) includes a translation by John Robert Morrison dated the previous day, 17 March 1839 on p. 41 (GB); both Waley and Chang say the edicts were not given to the hong merchants until the next day, 18 March 1839 (Waley, p. 32; Chang, p. 142).

languages jointly, declaring that henceforth they will never venture to bring opium, and that if any should be brought, upon discovery thereof, the parties concerned shall immediately suffer execution of the laws, and the property shall be *confiscated* to government. These commands are now given to the hong merchants, that they may convey them to the foreign factories and plainly make them known.<sup>26</sup>

There is no reference to any burning of any surrendered opium mentioned in the Morrison translation of the first edict to the Cohong. It is entirely possible that the hong merchants knew of the language *publicly burned or burnt and destroyed* in the first edict intended for the British merchants since Dr. Chang writes that during a conference with Lin on the afternoon of the 18th both "edicts in the name of the imperial commissioner were handed down to the hong merchants."<sup>27</sup> Slade (1839) adds that both foreign merchants and hong merchants were present when the translation of the edict to the foreigners was read (*italics added*):

Messrs. Dent, Wetmore, Green, Daniell, Dadabhoy Rustomjee, and James Matheson, were this day (19th March) invited to meet the hongmerchants at the Consoo hall, when the translation of the address to the foreigners from the high commissioner was read ....<sup>28</sup>

There does exist an implied threat in both the first edicts to the foreigners and the Cohong to close the trade if the opium is not surrendered: "Let our ports once be closed against you, and for what profits can your several nations any longer look"<sup>29</sup> as well as "Besides, either by the temporary stoppage of your trade, or by the permanent closing of the ports against you, what difficulty can there be in effectually cutting off your intercourse?"<sup>30</sup> can be read in the edict to the foreigners, while there is in the Cohong edict,

---

<sup>26</sup> *CR*, vol. 7, p. 619 (MD); the Morrison translation was also published in Slade (1839), p. 41 (GB).

<sup>27</sup> Chang, p. 142.

<sup>28</sup> Slade (1839), p. 38 (GB).

<sup>29</sup> *CR*, vol. 7, p. 611 (MD).

<sup>30</sup> *CR*, vol. 7, p. 614 (MD).

You leave no room for the consideration that the profits enjoyed by foreigners are those granted by the celestial court; and that if some day they should irritate the sacred wrath to the cutting off of their trade and closing of the custom-houses, not a mite of profit will there be for any of those nations to look for: and what then will there be for you?<sup>31</sup>

As an aside, the most immediate threat in the edict to the Cohong was to the lives of the hong merchants. Lin had demanded a reply and the signed bonds within three days in his edict to the foreigners: "A term of three days is prescribed for an address to be sent in reply to me. And at the same time let your duly attested and faithful bonds ...."<sup>32</sup> But in the edict to the Cohong, Lin literally threatened the hong merchants with death if they did not obtain the bonds from the foreigners:

Three days are prescribed, within which they must obtain the required bonds, and report in reply hereto. If it be found that this matter cannot at once be arranged by them, it will be apparent, without inquiry, that they are constantly acting in concert with depraved foreigners, and that their minds have a perverted inclination. And I, the high commissioner, will forthwith solicit the royal death-warrant, and select for execution one or two of the most unworthy of their number, confiscating their property to government, and thus will I show a lucid warning. Say not that you did not receive timely notice.<sup>33</sup>

It was this more immediate threat that both the hong merchants and the British took seriously, hastily convening an extraordinary meeting of the General Chamber of Commerce where Bridgman reports that "(t)he hong merchants declared that, unless *some* opium was given up, they felt assured two of their number would be beheaded in the morning! Finally, it was agreed that 1037 chests should be surrendered to the government to be destroyed."<sup>34</sup> In London, the *British and Foreign Review* reported that Commissioner Lin "had threatened to put two of them to death if

---

<sup>31</sup> *CR*, vol. 7, p. 617 (MD).

<sup>32</sup> *CR*, vol. 7, pp. 614-615 (MD).

<sup>33</sup> *CR*, vol. 7, p. 619 (MD).

<sup>34</sup> *CR*, vol. 7, pp. 621-622 (MD), italics Bridgman.

they did not procure the surrender of opium, say 1000 chests, by the next morning."<sup>35</sup>

A year later, Robert Inglis (a partner with Arthur Dent in the second largest opium trading concern at Canton) testified before the Select Committee on China Trade of the House of Commons in May of 1840 that "the foreigners were not very agitated, they were rather 'worked upon by compassion' for the hong merchants ... to subscribe 1030 chests."<sup>36</sup> Dent thought the commissioner's decapitation threat empty and was "perfectly convinced Howqua never expected it would be enforced."<sup>37</sup> In contrast, the Chinese merchants "seriously and solemnly" affirmed they were in fear for their lives.<sup>38</sup>

The first edict to the hong merchants demands that the opium be delivered but does not specify what the commissioner intends to do with it once it is surrendered. This edict does make two threats. The first was to cease trading with the foreigners and the second and more immediate was to the hong merchants themselves if they did not obtain the required bonds within three days. The time limit expired, the token opium was never delivered and Lin never carried out his threats of summary execution. Instead, he surrounded, threatened and held the several hundred foreigners hostage at Canton for 47 days until they surrendered the opium, effectively halting all trade.

In a much later edict to the Chinese dated July 1840 offering rewards for the murder of the English and booty for the seizing of their ships, Lin excepts (*italics added*) "guns, implements of warfare and Opium, which must be *delivered up to our officers*."<sup>39</sup> But he doesn't say what the officers will do with it.

## 2. NEW METHOD DESCRIBED

Lin finally enclosed what he intended to do with the foreigner's opium in a public proclamation issued only a few days before he

<sup>35</sup> *BFR*, vol. 10, p. 359.

<sup>36</sup> Chung, p. 200.

<sup>37</sup> Chang, p. 145.

<sup>38</sup> Chang, p. 147.

<sup>39</sup> Shuck, p. 186 (GB).

began. After enclosing his version of the emperor's edict commanding the opium be destroyed in Canton, Lin explained what he would now do. It was recorded in the *Chinese Repository* (italics added):

Accordingly, the 22nd day of the month (June 3rd), is appointed, for the civil and military officers, in the provincial city, to join those at the Bogue. There stone trenches will be opened; and *lime and salt* will be taken and mixed with the opium, until the drug is completely *transmuted* and destroyed. Then it will be poured off into the midst of the sea, even the very dregs. This proclamation we issue in obedience to the recorded pleasure of the emperor: that all you inhabitants of the coasts, and you foreigners in Canton, may look up to it and be instructed.<sup>40</sup>

Charles W. King in a letter to J. Ballestier, Esq. included a slightly different, more didactic and admonitory translation of this same edict (italics added):

Now, on the 22nd of the 4th moon (3d of June) we assembled the civil and military officers of the district at *Hoomun* (the Bogue), and caused vats or trenches of stone to be prepared, in which to *dissolve* the opium with *lime and salt*, and whence it might be conveyed into the sea, that no traces of it might remain. To make this known, we issue a special proclamation, commanding the people of the sea-side to acquaint themselves therewith, that they may henceforth respect the majesty and observe the commands of the Emperor. They must know that *an article so destructive is unfit to be used even for manuring the ground*. Let it never again be clandestinely brought here for sale, for all such attempts must lead to loss of life and property. A special proclamation. Taoukang: 19th year, 4th moon, 24th day (5th June).<sup>41</sup>

There are some significant differences in these two versions of the same edict by Lin enclosing the emperor's commands for the

<sup>40</sup> CR, vol. 8, p. 36 (MD).

<sup>41</sup> King, Charles W. "Imperial Edict respecting the Surrendered Opium, the Process of Destroying it, and etc. (Extracts from Letters of C. W. King, Esq. of Canton to J. Ballestier, Esq.)," *The London Times*, 1 November 1839, Issue 17188, column C, p. 2, found at [http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2\\_TTDA\\_2\\_\\_11/1/1839\\_\\_](http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2_TTDA_2__11/1/1839__); King italicizes *Hoomun*.

destruction of the opium. In the *Repository* version, the actions are referred to in the future tense: *will be opened*, *will be taken*, and *will be poured off*. This makes it appear as if this version of Lin's proclamation has been issued before the event. In King's version, the action is placed in the past tense: *assembled*, *caused*, and *prepared*. The version in the *Repository* is undated; that included by King is dated 5 June, two days after the work began. That of King's letter adds the name of the district, Hoomun, and the comparison to something not even useful for manure and the final warning regarding future importation.

John Slade also published his translation of the same edict (*italics added*):

We immediately despatched civil and military officers to the Bocca Tigris, and fixed the 22d of the moon for them to superintend the excavation of a stone lined trench, into which the opium is to be thrown, and mixed and stirred up with *unslaked lime and rock salt*, and be thus destroyed before the eyes of all the civil and military officers, and the dregs be then cast into the sea; for the natives of the sea coasts and the foreigners of the outside nations must be made to know how greatly the anger of the emperor has been excited; and to learn that *even ordure is more valuable as a manure for the land than the smoking mud*. - A special proclamation. 4th, moon, 19th day. (May 31).<sup>42</sup>

It is substantially the same as the others but Slade uses "unslaked lime and rock salt" instead of simply "lime and salt." Again, there is the notice that opium is unfit to be used as a manure but King's final admonition has not yet been added.

As an aside, this reference to manure is curious. In the Slade and King versions, the dregs are not fit to be used as a manure. Lime in the 21st century is thought of as an additive, a chemical component of fertilizer. But lime in the 19th century was considered simply as another kind of manure:

The use of lime as a manure, arises from its decomposing the insoluble organic matters of the soil, woody fibres, ulmine, &c., and producing other products more readily taken up by the sensitive radicals of the growing plants. It is hence on such soils as possess a large quantity of organic matter, but are still

<sup>42</sup> Slade (1839), pp. 109-110 (GB).

barren from its not being in the suitable condition, that the beneficial effects of lime are peculiarly marked.<sup>43</sup>

If they were to contain a large portion of lime with an organic matter like opium already decomposed, these dregs might be thought upon a first reading of the proclamation to be an excellent compost for the local farmers to use on their fields. Instead, the dregs are to be discarded also, not fit even for manure. No reason is provided, suggesting this tacked on sentence is an attempt at quelling obvious questions, a justification not an explanation.

This proclamation is Lin's official declaration of his change of method. What seems to have gone unnoticed is that in the 18 March edict, before he had received any opium, Lin wrote the opium would be *burnt and destroyed* or *publicly burned*. In this new decree some two and a half months later, after Lin has received all of the opium, the opium will now be *transmuted* (in the *Repository* version), *dissolved* in that included with the letter of Charles King as published in the *Times*, *destroyed* in the translation by Slade.

### C. THE EMPEROR'S INSTRUCTIONS

In this same public proclamation of late May or early June outlining his new method of disposing of the opium, Lin also makes reference to his suggestion that the opium be sent to Peking in the memorial sent 12 April 1839 and received 2 May 1839. In the Slade version this reference is translated (italics added): "We made an immediate report by express requesting the imperial will to send the opium to Peking, there to be strictly examined and *destroyed*."<sup>44</sup> In the version of the imperial edict which Lin enclosed in the same proclamation, the emperor refers to it the same way (italics added): "Lin Tsihseu and his colleagues have reported that the opium on board the store ships has been surrendered, and requested that it may be sent to Peking to be *destroyed*."<sup>45</sup> The translation published in the *Repository* is equally unspecific (italics added): "immediately

<sup>43</sup> Kane (1842), p. 567 (GB).

<sup>44</sup> Slade (1839), p. 110 (GB).

<sup>45</sup> Slade (1839), p. 110 (GB).

made report thereof to the throne by express" and "they request that it may be brought to Peking, and there be examined and *destroyed*."<sup>46</sup> That included in King's letter to the *Times* also prefers the general term (*italics added*): "we reported the same to the Emperor" and "that the same may be sent to the capital, in proof of their report, and there to be *destroyed*."<sup>47</sup>

Curiously, the emperor's original edict is available online and does not say this. In the original, the emperor notes that Lin and his colleagues had requested the opium be transported to Beijing under guard where it might be clearly examined and *burned*. The emperor's decree rewrites the exact same characters Lin used in his 12 April memorial: *shao* (first tone, FGGU, 9481.1) and *hui* (third tone, FHGE 9784.7), both containing the sign for fire, *huo* (third tone). Together, they are most often translated as "burn" or "burn down."<sup>48</sup> In a very legal sense, the inner court is aware that Lin requested the opium be burned in Beijing.

But the emperor's edict then instructs Lin not to send the opium to be burnt in Beijing but instead to destroy it in Guangdong (by melting or burning). The characters used for "destroy" in the original are *xiao* (first tone, CFB, 8912.7) and *hui* (third tone, FHGE, 9784.7). The first is usually translated as "melt, fuse, market or sell" while the second is "blaze, destroy by fire" because it contains the sign for fire, *huo* (third tone). Together, they are usually taken to mean literally "destroy (by melting or burning)" and by extension generally "to destroy."<sup>49</sup>

Lin suggests it be burned. The emperor then instructs it be destroyed (by melting or burning). Considered in the context of what Lin eventually does with the opium, the change of language is significant. It is curious that the emperor's edict did not order Lin to

<sup>46</sup> CR, vol. 8, p. 36 (MD).

<sup>47</sup> King, Charles W. *The London Times*, 1 November 1839, <http://infotrac.galegroup.com>.

<sup>48</sup> CBYWSM (TK), volume six, page 20b, lines 1 and 2, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024401](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024401).

<sup>49</sup> CBYWSM (TK), volume six, page 20b, line 7, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024401](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024401).



simply burn (*shao1 hui3*) the opium in Canton, repeating the characters that Lin had used in his April 1839 memorial.

#### D. THE REASON GIVEN FOR THE CHANGE OF METHOD

By the time the opium delivery was completed on 18 May 1839 some two months after Lin's original edict proclaiming his intention to burn it, there had been time for the foreigners to form other opinions as to what Lin would do with the foreign opium.

Superintendent Elliot "predicted that the Chinese would legalize the trade as a government monopoly. The profits from the sale of such a vast amount would make it easy for the Chinese authorities to set up a fund to compensate the original owners."<sup>50</sup> Among many of the foreign merchants there had developed much skepticism that Lin would ever destroy it. James Matheson, partner in Jardine's firm, had no idea what Lin would do with the surrendered opium but he was certain it would not be destroyed:

To anticipate events, I may add there seems no chance of the surrendered drug being destroyed, it being very carefully assorted according to quality, weighed, packed and stored partly in the Bogue forts, and partly in a spacious house about two miles east of Chuenpee, waiting instructions from Peking.<sup>51</sup>

Bridgman thought that the drug "was to be conveyed to Peking."<sup>52</sup> Lin had of course communicated the latter in a confidential memorial to the emperor dated 12 April 1839; Bridgman does not name his source. But Waley says that Lin's initial offer to convey the opium under guard to Beijing was "a mere gesture which he did not expect to be taken seriously, implying as it did that the Emperor

---

<sup>50</sup> Chang, p. 172.

<sup>51</sup> Matheson, James in a letter from Canton to William Jardine in London, 1 May 1839, found in Le Pichon, Alain. China Trade and Empire: Jardine Matheson and Company and the Origins of British Rule in Hong Kong 1827-1843. Oxford, England: Oxford University Press, 2006, pp. 357-358 (GB).

<sup>52</sup> *CR*, vol. 8, p. 36 (MD).

did not have full confidence in him."<sup>53</sup> Chang agrees, writing that Lin expected the emperor to order the opium destroyed at Canton.<sup>54</sup>

In fact, before all of the opium had been surrendered and before any reply to his suggestion had been received from the emperor, Lin began constructing giant trenches at Chinkow. It is not known exactly when he began this work, but his diary for May 13 reads, in part, "I took the opportunity of inspecting the trenches that are being made to drain off the opium when it is destroyed."<sup>55</sup> On May 19, the day after the opium delivery was completed, he composed an apology to the spirit of the sea "for polluting the sea with the opium that he now proposed to liquefy and run off into the Canton estuary."<sup>56</sup> From this, it seems clear that he intended to dispose of the opium at Canton before he received any reply from the emperor and that he supposed the emperor would agree to his plans.

Surprisingly, the emperor consented to Lin's first suggestion. On 2 May 1839 he accepted Lin's plan to send it to Peking to be inspected and burned. Lin received this edict on 24 May 1839.<sup>57</sup> On 25 May 1839, the day after receiving the new decree, Lin discussed with Admiral Kwan "the ways and means of transporting the opium to Peking, and three days later he memorialized the emperor recommending a new measure - shipping the opium north by sea."<sup>58</sup>

Could the opium have been sent by sea? Fay writes: "Pirates made the outer waters dangerous."<sup>59</sup> Shuck adds a long footnote in his *Portfolio Chinensis* (1840) about pirates (*italics added*):

From days of old all along the maritime Provinces of China, *Hae-tsih* Pirates have proverbially abounded. About 1810 they assumed a most formidable attitude, defying Government, and seizing upon and carrying (sic) off persons from shore, for whose ransom they demanded large sums of money. Several foreigners also were captured while in their small boats, and were only

---

<sup>53</sup> Waley, p. 45.

<sup>54</sup> Chang, p. 173.

<sup>55</sup> Waley, p. 42.

<sup>56</sup> Waley, p. 44.

<sup>57</sup> Chang, p. 172; Waley, p. 45.

<sup>58</sup> Chang, p. 172.

<sup>59</sup> Fay, p. 37.

redeemed by very considerable sums. It was Koshinga, a Chinese pirate, who took Formosa from the Dutch in 1662. At one time the piratical squadron which cruised off the coast of Canton consisted of as many as six hundred sail, varying in size from eighty to three hundred tons, and vast depredations were committed along the whole line of the sea-board. The Government failing in all other endeavors to put them down, published a general amnesty, offering full pardon to all who submitted. This succeeded, and the leader of the band is said to have been raised to some rank in the service of the Emperor. *Within the last two years there has been an enormous increase of Chinese pirates on the coast.* They have been known to attack and capture junks within sight of Macao.<sup>60</sup>

The adventurer-missionary-interpreter Charles Gutzlaff heard the same story about Koshinga in 1832 aboard the *Lord Amherst*:

Formerly the pirates had possession of most of these islands. ... The owners of their ships generally resided at Amoy or Formosa. ... In their engagements with the imperial fleet there were often victorious ... A regular system of piratical extortion once threatened to put a stop to the coasting trade ... hence, the mandarin's bribed the chiefs by the offer of military rank and service under the imperial banner.<sup>61</sup>

J. Elliot Bingham aboard the *Modeste* in 1840 anchored very close to where Gutzlaff had anchored some eight years earlier and also delights in filling in the story of

Kuo-shing, or Koshings, the son of a rich Chinese merchant, who fitted out a fleet to oppose those who are now the rulers, but were then the invaders of his country, - the Mantchow Tartars: but being defeated by them, he turned his arms against the Dutch and took possession of Formosa.<sup>62</sup>

Bingham encountered Chinese pirates on several occasions during his expedition to China.<sup>63</sup>

---

<sup>60</sup> Shuck, pp. 182-183.

<sup>61</sup> Gutzlaff, Karl F. *Journal of Three Voyages Along the Coast of China*. London: Frederick Westley and A. H. Davis, 1834, p. 170 (GB).

<sup>62</sup> Bingham, p. 178 (GB).

<sup>63</sup> Bingham, pp. 181-2, 205 (GB).

Chang says that on 24 August 1839 "five or six boats filled with Chinese pirates masquerading as soldiers had approached and boarded" the English schooner *Black Joke*.<sup>64</sup> Bingham believes they were soldiers masquerading as pirates: "The leader of this piratical band of assassins, Wang-chung, a naval officer, was shortly after this dastardly attack, rewarded and promoted by the high commissioner."<sup>65</sup> After the attack, the British left Macao<sup>66</sup> (where they had been residing since vacating Canton) in order to "embark on board the vessels at anchor in Hong Kong Bay and in the Typa."<sup>67</sup>

Besides the frequent reports of pirate attacks, there was the problem of the lack of an imperial fleet to transport the opium: "I have spoken sometimes of the Chinese Navy. But there was, in fact, at this period no such thing. There were merely a series of local navies acting under the orders of the local Governor-General. Nor was there any such thing as an Admiralty."<sup>68</sup>

Yet opium could be transported in China over a long distance. On 13 August 1839, Lin soaked a shipment of 20,000 catties that had been sent "from Ch'ao-chou, two hundred miles north-east of Canton,"<sup>69</sup> though whether it had been sent by land or by sea is unstated. Whether or not he could have transported it by sea, it seems clear that Lin intended his belated second suggestion to the emperor as just another formality.

Long before the emperor could receive Lin's second facetious proposal, on 29 May (Waley says 30 May), a few days after he sent off his second suggestion, Lin received new instructions from the emperor countermanding his previous edict. Now, the opium would not go to Peking, after all. Why? Teng Ying, a censor of the Chekiang circuit, had estimated that "it would take at least forty thousand bearers to carry the opium overland, and more than a

---

<sup>64</sup> Chang, pp. 199-200.

<sup>65</sup> Bingham, p. 99 (GB).

<sup>66</sup> Chang, p. 200.

<sup>67</sup> Bingham, p. 100 (GB).

<sup>68</sup> Waley, p. 65.

<sup>69</sup> Waley, p. 60; remembering that one cattie equals 1.333 pounds, then Lin would have processed approximately 26,667 pounds (12,000 kilograms) of opium or about 13 tons.

hundred large boats with crews totalling one or two thousand men to transport it by water."<sup>70</sup> This seems excessive. The opium was stored in small amounts on only twenty-two British ships and was being managed by only several hundred foreigners. The opium had already been transported without too many difficulties all the way from India.

The memorial of Teng Ying is convincing. It is received on 8 May 1839, only six days after the emperor agrees to Lin's suggestion to send the opium to Peking to be examined and burned. That very day or the day after, Teng Ying's proposal is fully and completely accepted and the emperor's previous edict is suddenly overruled and made null and void.

How much power had the censors?

The Too-yu-she, or "censors," constitute a separate body, whose office is called Too-cha-yuen. It is their duty to watch over the words and actions of the emperor, and to upbraid him freely for every species of misdemeanor. We are likely, perhaps, to be reminded, by this institution, of the Roman censors, whose stern animadversions filled that queen of the earth with trembling; but we shall be greatly mistaken if we imagine that a Chinese censor is the same unbending man. They are a servile class, who fawn when they ought to blame; but those few exceptions to this general remark are extolled to the skies; and, under such a despotic government, unquestionably deserve great credit.<sup>71</sup>

The specific change of language using *xiao1 hui3*, or destroy (by burning or melting) shows up first in the memorial by Teng Ying, as do references to assembling the civil and military officers, inspecting the opium openly, and the references to the subjects living along the sea coasts and the barbarian residents.<sup>72</sup>

The emperor's revised edict even refers specifically to the memorial of the imperial censor Teng Ying and the logistical

<sup>70</sup> Chang, p. 172; Waley, p. 46; *CR*, vol. 8, p. 36 (MD).

<sup>71</sup> Gutzlaff, Charles. A Sketch of Chinese History, Ancient and Modern, Comprising a Retrospect of the Foreign Intercourse and Trade with China. Vol. 1. New York: John P. Haven, 1834 (GB), p. 35.

<sup>72</sup> CBYWSM (TK), volume 6, page 20a, lines 5, 6 and 7, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024401](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024401).

demands of transporting the opium a great distance. Subsequently, it orders that, "when the whole amount surrendered is received, they may there on the spot assemble the civil and military officers, publicly and jointly make reexamination, and in their presence destroy the opium; thus causing the inhabitants on the coast, and the foreigners in Canton, alike to see and to hear, that they may know and tremble thereat."<sup>73</sup> The same characters *xiao1* and *hui3*, meaning "destroy (by melting or burning)" are rewritten in the emperor's new edict.<sup>74</sup> Either the day he receives this revised imperial edict or the day after, Lin issues his public proclamation describing his new method for disposing of the opium using lime and salt, or unslaked lime and rock salt, depending on the translation. By 31 May 1839 Lin has written imperial authority to do what he had been planning to do for at least a month.

But why did he bother to change from the traditional method of fire and wutung oil? Dr. Tan Chung writes that it was because of the problem of "how to completely destroy the drug without leaving any remnants anywhere ... (because many people would) search for the undestroyed remnants after the destruction was done."<sup>75</sup> This mention of "undestroyed remnants" also shows up in a line in Lin's "Address to the Spirit of the Sea" of 19 May, recorded in single quotes by Waley (italics added): "If it had been cast into the flames, the *charred remains* might have been collected."<sup>76</sup> Maurice Collis, in the mid-twentieth century *Foreign Mud*, elaborates on the theme: "Were he to try and burn it, there would remain a residue which would supply tens of thousands with enough for a smoke, indifferent indeed, but better than nothing."<sup>77</sup> By itself, this reads like something out of a Sax Rohmer novel with an image of legions of depraved junkies picking through the still smouldering charnel grounds, wreathed in wisps of pale, white smoke rising from the ashes.

<sup>73</sup> *CR*, vol. 8, p. 36 (MD).

<sup>74</sup> CBYWSM (TK), volume 6, page 20b, line 7, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024401](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024401).

<sup>75</sup> Chung, p. 198.

<sup>76</sup> Waley, pp. 44-45.

<sup>77</sup> Collis, M. *Foreign Mud*. London: Faber and Faber, 1946, p. 231.

Kuo's Lin, however, offers much the same explanation in a memorial sent when he was halfway through the process:

The traditional practice of burning the drug, with wu-tung oil mingled with it, is indeed a good method. But we learned that after the burning, there was always much residue remaining on the ground which experienced purifiers of opium could easily dig out and gain twenty or thirty per cent. By so doing, therefore, the evil still cannot be brought to an end.<sup>78</sup>

In the context of the entire document, the translation of these sentences reads as if out of place.

Can opium be used that has already been burned? The Reverend A. S. Thelwall suggested that it could be in his Iniquities of the Opium Trade (1839):

One fact, in addition, needs to be mentioned. It appears that the opium may be smoked a second time. Thus, after having satisfied the more luxurious appetite of the wealthy consumer, the refuse may serve to feed the same depraved appetite in a lower class of victim, and thus double the mischief.<sup>79</sup>

Thelwall did not smoke opium and had never been in either India or China.

Experimental evidence comes from the chemical engineer Andre Barbier who wrote a treatise on isolating morphine from opium in 1950 that appears on the United Nations Office of Drug Control website. He records what happened to some opium after an accidental fire:

In 1930, however, we had to treat opium, saved from the fire at Smyrna, which contained 10.5 percent of morphine. This opium, which had been subjected to a fairly high temperature, had lost part of its volatile acids and

---

<sup>78</sup> Kuo, p. 245; see also chapter 20 for a discussion of Lin's sources of knowledge for his curious process.

<sup>79</sup> Thelwall, Algernon Sydney. The Iniquities of the Opium Trade with China. London: W. H. Allen and Co., 1839, p. 20 (GB).

the morphine was in a form insoluble in water (probably that of the base), but soluble in lime, and this enabled it to be detected by the assay.<sup>80</sup>

So it appears possible to at least detect morphine in burned opium with lime.

While he was away, his assistants believed there was no morphine left in the salvaged opium:

They burned these marcs<sup>81</sup> in the boiler with the morphine which they still contained. When I returned and took stock I found that 125 kilograms of morphine had disappeared in this way.<sup>82</sup>

Opium that has been subjected to a fairly high temperature can be treated with lime to detect (and perhaps extract) the morphine. On the other hand, his assistants burned the marcs (the residue) in the boiler and destroyed 125 kilograms of morphine, the equivalent of perhaps 1250 kilograms of opium.

Unfortunately, Lin's explanation does not exist in the original. The text where Lin gives such an explanation to the emperor for his change of method (which is ostensibly translated by P. C. Kuo in his *A Critical Study of the First Anglo-Chinese War with Documents*) does not occur in the original version of the *Chou Ban Yi Wu Shi Mo* (*Dao Guang* Era) available online. Nor is it in the print version archived at Harvard's Yenching Library where Kuo may have done his work in the early 1930s. Chang, working at Harvard in the early 1960s, also does not refer to them. Earlier, on the same page, there are other references out of place that Kuo ostensibly translates that

<sup>80</sup> Barbier, Andre. "The Extraction of Opium Alkaloids," UNODC Bulletin of Narcotics 1950 Issue 3-003 found at [www.unodc.org/unodc/bulletin/bulletin\\_1950-01-01\\_3\\_page004.html](http://www.unodc.org/unodc/bulletin/bulletin_1950-01-01_3_page004.html), p. 4.

<sup>81</sup> A marc, in pharmacology, is "the residue that remains following the extraction of active principles from a vegetable drug by means of a solvent" according to <http://dictionary.reference.com/browse/marc> citing the Random House Unabridged of 2006; the Merriam Webster Medical Dictionary of 2002, found on the same site, has "an insoluble residue remaining after extraction of a solution (as a drug) with a solvent." Here, Barbier may be referring to the marc as what remained after the fire.

<sup>82</sup> Barbier, p. 5.



also do not exist in the originals.<sup>83</sup> This is not to say the missing lines do not exist in some other version. It does suggest that Kuo is defending and explaining instead of translating.

## E. DISCUSSION

The traditional method of disposing of confiscated opium used fire and wutung oil. Lin and others used this method in 1838. Lin's proclamation of his new method in late May or early June is the official origin of the Salt, Lime and Water Tale. He states he intends to transmute, dissolve or destroy the opium with salt and lime or rock salt and unslaked lime, depending upon the translation. This is a direct turnabout from his edict of 18 March 1839, two and a half months earlier, where he had said that he intended to burn, or burn and destroy, the opium of the foreigners. He did not possess the opium when he issued that edict. Once the opium is completely in his possession, the method of destroying it is now changed.

The reason offered for changing to the new method is the "charred remains." It is possible to reuse opium that has been subjected to a high heat. Morphine from burned opium is soluble in lime. It is also possible to burn opium or its remnants. It must be observed that when he had burned opium with fire and wutung oil in Hu-kwang province only nine months earlier, Lin had simply tossed the remnants "into the rivers." By 19 May 1839 the issue is worth an elaborate poem to the sea spirit. This new found concern over the remnants seems on the surface unlikely and dubious, an excuse not an explanation for the sudden change from the traditional method of fire and wutung oil. The "problem" of what to do with the remnants, he seems to have previously solved. Further, this excuse offered by Kuo for the change of method is suspicious and does not appear in the original.

---

<sup>83</sup> CBYWSM (TK), volume 7, page 7a, lines 8, 9 and 10, found at [www.cadal.zju.edu.cn/Reader.action?bookNo=02024402](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024402); unpublished email correspondence checking the version on file at the Harvard Depository, No. 2488 0404b, specifically entitled *Chou Ban yi wu shi mo* [Wenqing deng feng chi zuan ji]. Beijing: *Gu gong bo wu yuan*, *Minguo* 18-19 [1929-1930].

VIII  
CONTEXT FOR THE EYEWITNESS  
ORIGINS OF THE SALT, LIME AND WATER TALE

---

- VIII. CONTEXT FOR THE EYEWITNESS ORIGINS OF THE  
SALT, LIME AND WATER TALE
- A. THE OPEN JOBSITE HYPOTHESIS
  - B. THE EMPEROR'S EDICT
  - C. THE INTERPRETATION AND OBSERVATIONS  
OF BRIDGMAN
  - D. THE INTERPRETATION AND OPINIONS OF KING
  - E. THE INTERPRETATION OF LIN
  - F. LIN'S MEMORIALS TO THE EMPEROR
  - G. DISCUSSION

**B**EFORE examining the eyewitness testimony, it may be useful to consider who was *not* present. One of the current ideas about the event is that it was open to any and all observers. If true, then the three eyewitness accounts could be considered typical. However, there is much evidence against this. The credibility given to the eyewitness testimony will depend in part on this notion of an open site.

A. THE OPEN JOBSITE HYPOTHESIS

Dr. Chang defends this thesis of an open site yet he also contradicts it. He begins by examining the doubters: "No matter how faithfully Commissioner Lin carried out his task, nothing could quiet the inveterate critics."<sup>1</sup> Besides Gutzlaff's grumbling, it "was charged by the *Quarterly Review* that no Chinese boatmen were allowed to approach the scene and the editor of the *Canton Register*

---

<sup>1</sup> Chang, p. 175.

had applied for permission to watch the destruction but was refused."<sup>2</sup> With this he references an article published in London during the war that asked (*italics added*):

But has Lin acted honestly in this proceeding? Did he really destroy the whole amount of this immense mass of opium? We ask this question, because the 'Resident in China' assigns some grounds for doubting it. None of the Chinese boatmen even were allowed to approach the place. *The editor of the 'Canton Register' applied for permission to see the process*, on the ground that foreigners, if excluded, would not believe the opium had been destroyed - *but he was refused*. The Commissioner's friend - Mr. King - we are told, and he alone, was allowed that favor. He went to the place one day, protected by the armed boats of two American ships of war, and was at once admitted.<sup>3</sup>

Dr. Chang refutes this with the following:

These statements, made in London by one who had never been on the spot, are contradicted by the eyewitness account of Bridgman. Moreover, the Chinese officials were ordered by imperial edict to urge and welcome spectators, foreign or native, to see the destruction with their own eyes and thereby be awakened to the fact that the government was adamant in its prohibition of opium. According to Lin, many people came from near and far.<sup>4</sup>

Dr. Chang adds two footnotes for evidence, one from the first page of Bridgman's account in *The Chinese Repository* and the other from the *Ch'ou-p'an i-wu shih-mo* (A Complete Account of our Management of Barbarian Affairs), the second memorial by Lin to the emperor received 28 July 1839 and translated by Kuo. So in all, Dr. Chang alleges three pieces of evidence that the process was open to spectators: the language in the emperor's decree, the first page from Bridgman's account, and the Chinese collected papers on the era.

---

<sup>2</sup> Chang, p. 175.

<sup>3</sup> Gifford, William, et al, editors. "Chinese Affairs," *The Quarterly Review*, vol. LXV, Dec. 1839/Mar. 1840. London: John Murray, 1840, p. 556 (GB).

<sup>4</sup> Chang, p. 175.

## B. THE EMPEROR'S EDICT

As for what the decree of the emperor intended, the relevant lines were translated in the *Chinese Repository* (italics added):

Rather let it be given over to Lin Tsihseu, Tang Tingching (Teng T'ing-chen, the Governor-General), and E. Leang (I-liang, the Governor),<sup>5</sup> that, when the whole amount surrendered is received, they may there *on the spot assemble the civil and military officers*, publicly and jointly make reexamination, and in their presence destroy the opium; thus causing the inhabitants on the coast, and the foreigners in Canton, alike to see and to hear, that they may know and tremble thereat. Respect and obey this mandate.<sup>6</sup>

Charles W. King in a letter to J. Ballestier, Esq. included a slightly different translation of this same edict (italics added):

It is inexpedient, therefore, to send the opium to the capital; and we commit it to Lin and his associates (when the surrender is completed) to *assemble the local officers, civil and military*, and to cause it to be destroyed in their presence. Thus will the people of the sea-side and the foreigners at Canton be made to see and tremble. Respect and Obey.<sup>7</sup>

John Slade also published his translation of the same edict (italics added):

Lin Tsihseu and his colleagues are to *assemble the civil and military officers* and destroy the opium before their eyes, thus manifesting to the natives dwelling on the sea coasts and the foreigners of the outside nations an awful warning. - Respect this. - Obey respectfully."<sup>8</sup>

---

<sup>5</sup> Chang, pp. 70, 107.

<sup>6</sup> *CR*, vol. 8, p. 36 (MD).

<sup>7</sup> King, Charles W. "Imperial Edict respecting the Surrendered Opium, the Process of Destroying it, and etc. (Extracts from Letters of C. W. King, Esq. of Canton to J. Ballestier, Esq.)," *The London Times*, 1 November 1839, Issue 17188, column C, p. 2, found at [http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2\\_TTDA\\_2\\_\\_11/1/1839\\_\\_](http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2_TTDA_2__11/1/1839__).

<sup>8</sup> Slade (1839), pp. 109-110 (GB).

The emperor's edict by itself does not exactly "urge and welcome spectators, foreign and native" to be present in any of the translations.<sup>9</sup> The only ones required to be present are the "civil and military officers" and Lin, Tang Tingching and E. Leang.<sup>10</sup> It is the destruction of the opium before this select group that will somehow cause the locals on the coast, and the foreigners in Canton *to see and to hear... know and tremble* in the *Repository* version,<sup>11</sup> *to see and tremble* in King's version,<sup>12</sup> receive an *awful warning* in Slade.<sup>13</sup> What exactly they will "see" if they are not present is unclear. The phrases "to see and to hear" and "know and tremble" or even "see and tremble" sound like imperial boilerplate, but these are the translations (by whom it is unstated, possibly J. R. Morrison) recorded in the *Chinese Repository* and in King's letter (also unstated) to the *Times*. Dr. Tan Chung translates it as "in order that all the residents along the coast and the foreigners at Kwangtung will all see it or hear it, be shocked and deafened by it."<sup>14</sup> Slade translates it generally as that the foreigners and natives will receive an "awful warning."

#### C. THE INTERPRETATION AND OBSERVATIONS OF BRIDGMAN

Bridgman gives his own opinion of the language in the emperor's decree on the first page of his written account: "That liberty to do this should be given, seems evidently to have been intended by the emperor's own mandate, in which he commands,

---

<sup>9</sup> Chang, p. 175.

<sup>10</sup> *CR*, vol. 8, p. 36 (MD).

<sup>11</sup> *CR*, vol. 8, p. 36 (MD).

<sup>12</sup> King, Charles W. "Imperial Edict respecting the Surrendered Opium, the Process of Destroying it, and etc. (Extracts from Letters of C. W. King, Esq. of Canton to J. Ballestier, Esq.)," *The London Times*, 1 November 1839, Issue 17188, column C, p. 2, found at [http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2\\_TTDA\\_2\\_\\_11/1/1839\\_\\_](http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2_TTDA_2__11/1/1839__).

<sup>13</sup> Slade (1839), p. 110 (GB).

<sup>14</sup> Chung, Tan. *China and the Brave New World*. Durham, NC: Carolina Academic Press, 1978, p. 198.

that the opium should be destroyed in Canton, where natives and foreigners 'both alike might hear of it, and see it.'<sup>15</sup> Bridgman read the emperor's edict as permission for outsiders to observe.

Bridgman's observations both support and refute Chang's argument. The first page of his account only records the one day voyage from Macao up the delta to Chuenpe, where the barbarians anchored and waited a day for permission from Lin to approach the place, another hour or so away by boat. Bridgman does not record any escort by American warships.

Bridgman does write on that first page, "Contrary to our expectations, no obstacles were opposed to our wishes; and I have only to regret, that others could not have availed themselves of a like opportunity to witness the same scene."<sup>16</sup> Though no one opposed their visit, he did not expect to be welcomed and the phrase "that others could not have availed themselves of a like opportunity" in this sentence may refer to the refusal given to John Slade, editor of the *Canton Register*, known as the mouthpiece of an English trader reputed to be the largest opium smuggler in China, William Jardine (who Lin considered a personal enemy and who had left earlier in the year, banned from China). In the same way, Bridgman's *Chinese Repository* was said to emanate from "the second floor drawing-room of Number 1, the American factory - rented by Olyphant and Company and known from the piety of its occupants as Zion's Corner,"<sup>17</sup> being the mouthpiece of the American missionary (and anti-opium) movement in Canton.

To be fair to Chang's case, there are numerous references on other pages in Bridgman's account testifying to the presence of others nearby. When they left Chuenpe the next day in the *Morrison's* gig, they were led by "Loo Taeyue, a naval officer of the rank of captain" in his "own boat, manned with about sixty seamen, with a few attendants. ... As we passed through the fleet, several

---

<sup>15</sup> Bridgman, *CR*, vol. 8, p. 70 (GB).

<sup>16</sup> Bridgman, *CR*, vol. 8, p. 70 (GB).

<sup>17</sup> Fay, p. 21.

other boats, with officers on board, joined the party, some under sail, and others with rowers - all in high spirits and full of glee."<sup>18</sup>

When they reached Chunhow (Chinkow, Zhenkou) an hour later, "(a) good many boats were passing and repassing the river, exhibiting on all sides the aspect of quiet and industry." And as they passed Chunhow (*italics added*), "*(c)rowds of spectators* appeared in the boats, on the houses, and on the sides of the hill, as our party passed by the village. As we approached the landing-place, the war-boats and junks beat a salute; and two divisions of troops, in full uniform, were drawn up under their respective standards, one on the south, the other on the north, of the enclosure."<sup>19</sup>

It is unclear, however, what the spectators could have seen. Bridgman twice records that the site was barricaded: "The site selected for the deposit and destruction of the opium, is on the bank of the creek, at the brow of a hill, a short distance from the north end of the village, including an area about 400 or 500 feet square, strongly impaled with bamboo."<sup>20</sup> The spectators were not allowed to enter:

Our party now stepped from the gig, and passing along a pier, entered the enclosure. This, as described above, was a large area, surrounded by a strong palisade, like a Malayan camp. There were gates on each side, excepting the east; at these, sentinels were stationed, and no person was allowed to enter without a ticket.<sup>21</sup>

Dr. Hsin-pao Chang records the same: "Large crowds were attracted to the scene, but no unauthorized persons were allowed to enter the palisade."<sup>22</sup> Inside the palisade, Bridgman estimated 500 workmen and 60 to 80 officers "employed as inspectors and overseers." Further, each of the three tanks that he counted "had its own fence."<sup>23</sup>

---

<sup>18</sup> CR, vol. 8, p. 71 (GB).

<sup>19</sup> CR, vol. 8, p. 72 (GB).

<sup>20</sup> CR, vol. 8, p. 72 (GB).

<sup>21</sup> CR, vol. 8, p. 73, [www.macaudata.com](http://www.macaudata.com).

<sup>22</sup> Chang, p. 174.

<sup>23</sup> Bridgman, op. cit., p. 73 (MD).

Bridgman's account supports Chang in that there were spectators but he also says no one unauthorized was permitted entry. Bridgman also supports the statement in the *Quarterly Review* that the Chinese boatman could pass but not approach and that others had been refused permission (perhaps Slade).

#### D. THE INTERPRETATION AND OPINIONS OF KING

Like Bridgman, King also read Lin's proclamation as permission to observe:

The sight of this proclamation confirmed me in my previous intention, to proceed to the Bogue, on the first arrival of a ship to my consignment, to witness the process of destroying the opium, and to seek a conference with the commissioner, respecting the existing and the apprehended difficulties.<sup>24</sup>

King also both casts doubt upon and supports Chang's thesis that anyone could watch:

It is highly probable that the commissioner, having unbent for a moment to a private foreigner, will fall back upon his rank, and guard with the usual care the avenues of petition. I see no reason, however, why any well-disposed foreigner may not satisfy himself, if he have any doubt left as to the destruction of the opium.<sup>25</sup>

On the one hand King does not think others will have much luck petitioning the commissioner; on the other, he can't see any reason others should not be allowed to watch which would make his own observations typical and give them more credence.

#### E. THE INTERPRETATION OF LIN

The interpretation of the emperor's edict by Lin is the most important because he is in charge of implementing it. In his second memorial on the processing of the opium, he tells the emperor of the

---

<sup>24</sup> King, the *Times*, 1 Nov 1839, //infotrac.galegroup.com.

<sup>25</sup> King, the *Times*, 1 Nov 1839, //infotrac.galegroup.com.



arrival of the foreigners: "And also the American merchants, King, Bridgman, and others, together with their families, came by sampan from Macao and asked permission to the spectacle from Yan Yin-ko, Commander of the Naval Cruisers."<sup>26</sup>

Lin writes that he decided to grant them permission to observe for two reasons, the first based on his interpretation of the emperor's edict and his own proclamation:

Considering that a previous edict by your Majesty had permitted the barbarians resident in Canton to understand the situation fully so that fear would arise in their minds, we had upon a former occasion made a public proclamation to that effect. The coming of the American barbarians at present is in accordance with that proclamation.<sup>27</sup>

But it is also clear that for Lin not just any foreigner is welcome. His second reason for admitting these particular barbarians is they were not personally acquainted with the opium trade. Lin was fully aware of this (*italics added*):

And as we examine into the conduct of *King* and other barbarian merchants, we are fully convinced that they always traded righteously and *never dealt in opium*.<sup>28</sup>

This means that Lin's foreign observers were handpicked and deliberately ignorant of the details of the opium trade. Lin suggests this is at least part of the reason they were allowed to observe in the first place.

#### F. LIN'S MEMORIALS TO THE EMPEROR

Waley translates and quotes Lin's first memorial written from Zhenkou to the emperor on what the spectators could or could not see:

---

<sup>26</sup> Kuo, p. 248.

<sup>27</sup> Kuo, pp. 248-249.

<sup>28</sup> Kuo, p. 249, translating Lin's second memorial to the emperor on the disposition of the opium.

The inhabitants of the coastal region', Lin informs the Emperor, 'are coming in throngs to witness the destruction of the opium. They are, of course, only allowed to look on from outside the fence and are not permitted access to the actual place of destruction, for fear of pilfering. The foreigners passing by in boats on their way up to Canton and down to Macao all get a distant view of the proceedings ....'<sup>29</sup>

Kuo has a slightly different translation:

At the time of the destruction of the opium, the inhabitants of the coastal regions gathered around to see the operation in great numbers. But they were kept outside the fences and never were they allowed to step in, so that all possible frauds could thereby be avoided. The barbarians going up to Canton or down to Macao that passed by the spot only gazed at the place from a distance ....<sup>30</sup>

For his argument that the process was open to observers, Dr. Chang also references the *IWSM*, 7:18b.<sup>31</sup> This is the *Ch'ou-p'an I-wu Shih-mo*, (The Beginning and End of the Management of Barbarian Affairs) published in 1930. Kuo also translates from the same source, which he references as the *C. P. Y. S. M.* (T. K.), 7/18-20,<sup>32</sup> which is Lin's second memorial written from Zhenkou to the emperor.

In this second memorial, upon the completion of the process, Kuo says that Lin wrote:

From afar as well as from the immediate vicinity the people come to look at the destruction. The number of spectators was particularly great at the time of the Dragon Festival (15 June 1839); they all gazed in consternation.<sup>33</sup>

What they would have seen on 15 June is uncertain because Dr. Chang writes that little or no opium was destroyed on this holiday:

---

<sup>29</sup> Waley, p. 49.

<sup>30</sup> Kuo, p. 247.

<sup>31</sup> Chang, p. 267, endnote 68.

<sup>32</sup> Kuo, p. 247.

<sup>33</sup> Kuo, p. 248.

The fact is that from June 3 to June 21, with the exception of the first day, when the process was still under experiment, and June 15, a holiday, the smallest quantity destroyed in any one day was 830 chests (on June 4).<sup>34</sup>

So yes, Chang is correct in that spectators came "from near and far."<sup>35</sup> Yes, there were spectators, but no they were not allowed to enter and could only "look on from outside" the first palisade or from the river "get a distant view of the proceedings" according to Waley.<sup>36</sup> Waley mainly uses the "six-volume corpus of texts about the Opium War published at Shanghai in 1955 under the title *Ya-p'ien Chan-cheng Tzu-liao Ts'ung-k'an*, (Corpus of Material about the Opium War)" and when he thought it necessary "some of the collections upon which the corpus draws: for example, the *Ch'ou-p'an I-wu Shih-mo* and the *Shih Lu* ('Veritable Records') of Tao-kuang's reign."<sup>37</sup> Chang references the *Ch'ou-p'an I-wu Shih-mo*.<sup>38</sup>

## G. DISCUSSION

The purpose of this chapter was to try to decide just how open to observers Lin's curious processing of the opium really was. Dr. Hsin-pao Chang defends it as very open and he points to the emperor's decree, the first page of Bridgman's account, and Lin's second memorial to the emperor describing his new method. The emperor's decree specifically commanded only that certain government officers be present, but it also suggested that as a result of the destruction, the foreigners would come "to see and to hear." Slade translates the latter as a boilerplate "awful warning." Bridgman and King interpreted the emperor's edict as meaning any barbarians could observe. Lin interpreted the edict in a different manner. He attached a second condition that few of the resident foreigners could comply with, i.e., non-involvement in the opium

---

<sup>34</sup> Chang, p. 175.

<sup>35</sup> Chang, p. 175.

<sup>36</sup> Waley, p. 49.

<sup>37</sup> Waley, p. 9.

<sup>38</sup> Chang, p. 267.

trade. This meant that not everyone who wished to observe received permission. Slade, defender of the opium traders, was not invited.

The first page of Bridgman's account both supports and refutes the argument of an open site. Yes, permission was granted but no, not to everyone. In the rest of their accounts, both Bridgman and King say the site was open to observers but they also give much evidence that the site was doubly fenced, closed to inspection and entry denied to those without a ticket. The general public was kept away.

Lin's second memorial to the emperor describing his new method of processing the opium mentions numerous spectators, particularly around the time of the Dragon Festival. But Chang admits that little or no opium was processed on this holiday. Lin also says in his first memorial that the spectators were kept outside the first fence. These onlookers would have had a very limited view.

The site was not open. The emperor did not command it to be so. Lin did not allow it to be so. Not everyone who asked for permission received it. Spectators were kept out. Entry was by ticket or invitation only.

Only four foreigners witnessed the process (Bridgman does not record that the six oarsmen from the *Morrison* were permitted entry): the missionary-publisher Bridgman, the stridently anti-opium merchant King, his wife Charlotte, and Captain Benson of the *Morrison*, belonging to Olyphant and Company, all Americans, all anti-opium, all from Zion's Corner, all personally and professionally ignorant of the details of the opium trade. Only two of them left written eyewitness accounts. Of the many Chinese who must have seen the process, only Lin's account survives. These accounts cannot be considered typical.

The change of language in the emperor's decree is significant. As noted in chapter seven, the original online version of the emperor's edict first recognizes that Lin suggested the opium be sent to be Beijing to be examined and burned, repeating the same characters, *shao* and *hui*, that Lin used in his 12 April memorial. But the decree then demands Lin dispose of the opium there in Canton, using the characters *xiao* and *hui*, meaning literally "destroy (by melting or burning)." Lin appears to have included only

the latter part of the emperor's edict in his own proclamation of late May and early June. (He also repeated only the latter part of the emperor's edict line by line in his first memorial from Zhenkou sent when he was half finished, as if needing to justify his change of method.<sup>39</sup> Here Lin very carefully elides the part where he ever suggested it be sent to Peking to be burned (*shao hui*). Instead, he reminds the emperor only that he suggested it be transported under guard (*jie4 Jing1*) to Beijing.<sup>40</sup>) It appears from the uniformity of the translations offered by the foreigners of Lin's public proclamation that Lin also did not include this part (*shao hui*) in that earlier proclamation either.

The change of language from *shao hui*, meaning "burn" or "burn down" to *xiao hui*, meaning "destroy (by melting or burning)" offers Lin the legal authority *not* to burn the opium if he wishes. In the memorial by Chou T'ien-chueh, for example, coupled with wutung oil, *xiao hui* definitely meant burn. But Lin chooses instead to "melt" (*xiao hui*) the opium with salt and lime.

This may not be what the emperor intended. Prior to Lin, opium had been incinerated in showy, public burnings in Canton. A grand bonfire of the barbarian opium (perhaps at night) would indeed "send a message" to the residents on the coast and the foreign residents. But the new language in the emperor's edict does not specifically command this. The change of language arrives via Teng Ying, imperial censor. It is adopted the next day. The emperor needs no defense, but the slight but significant change from *shao* to *xiao* (both first tone) obviously begs the question of who has written the emperor's new edict and whether the emperor has read it or is simply having it read out to him aloud before he approves it.

<sup>39</sup> Compare lines 1 to 7, page 20b, volume 6 with lines 6 to 10, page 6b and line 1, page 7a of volume 7 of the CBYWSM (TK), found at [www.cadal.zju.edu/Reader.action?bookNo=02024401](http://www.cadal.zju.edu/Reader.action?bookNo=02024401) and ...bookNo=02024402.

<sup>40</sup> CBYWSM (TK), vol. 7, page 6b, line 2.

IX  
THE EYEWITNESS ORIGINS  
OF THE SALT, LIME AND WATER TALE

---

- IX. THE EYEWITNESS ORIGINS OF THE SLW TALE
- A. KING'S ACCOUNT
  - B. BRIDGMAN'S ACCOUNT
  - C. LIN'S ACCOUNT
  - D. DISCUSSION

WHEN should one story be preferred over another? The Burning Tale is the most popular; it is repeated the most often on websites, by authors, and in histories. But the Salt, Lime and Water Tale has something the others don't: first person eyewitness reports to substantiate it. Unfortunately, it does not have many.

Only four westerners are known to have actually witnessed what happened to the opium: Charles W. King, his wife Charlotte, Elijah C. Bridgman, and Captain Benson of the *Morrison*. Of these, only two, Elijah C. Bridgman and Charles W. King, are known to have published first hand accounts. On the Chinese side, of the hundreds who worked there, inspected or oversaw the process, only Lin provided a written account (signed by Teng Ting-chen and Iliang) in two memorials to the emperor. Ideas of what actually took place at Chunhow in 1839 depend on only these three first hand, written eyewitness accounts. Each had personal and professional biases, reasons not to tell the truth or the whole truth. Always keeping in mind the well-known adage that "no one lies like an eyewitness," it is certainly worth examining their observations.

## A. KING'S ACCOUNT

Relevant sections of King's account can be pieced together online from two sources, Warren (1840) and Allen (1853). It begins:

We reached at 11, the spot where the drug is being destroyed, and where the Commissioner has his temporary residence. We found the spot to be an enclosure of some 400 feet square, well palisaded, the side opposite (away from) the river, being occupied by neat buildings, for storing the Opium, &c. The larger part of the foreground, was covered by three vats of perhaps 75 feet by 150 each, opening by sluices into the river. The chests of Opium, after being re-weighed, and broken up in the presence of high officers, were brought down to the vats; the contents, ball after ball, broken down and crushed upon platforms, raised on high benches above the water, and then pushed by the feet of the coolies into the receptacles beneath. A large number of men were employed in thus mascerating the balls for some days with long rakes, until the whole became a fetid mud, when the sluices were raised, and the vats emptied into the river. Every precaution seemed to be used by the officers to ensure the complete destruction of the drug, the spot being well guarded, the workmen ticketed ....<sup>1</sup>

His account concludes:

... the workmen ticketed, etc.; in fact, we turned from the scene fully satisfied that the work was being performed with rigid faithfulness, and much disposed to wonder that, while Christian governments are growing and farming this deleterious drug, this pagan monarch should nobly disdain to enrich his treasury with a sale that would not fall short of Rs. 20,000,000.<sup>2</sup>

It is important to notice here that in neither of these excerpts does King mention the salt and the lime.

The salt and lime are the heart of the operation but King does not notice them? King's description is part of a longer letter to a friend that was printed in the *Singapore Free Press*, the *Asiatic*

---

<sup>1</sup> Warren, Samuel. The Opium Question. London: James Ridgway, 1840, pp. 11-12 (GB).

<sup>2</sup> Allen, Nathan. The Opium Trade. Lowell, MA: James P. Walker, 1853, pp. 47-48 (GB).

*Journal* and many London newspapers. The *Quarterly Review*, for example, says (*italics added*):

This done, Commissioner Lin is said to have lost no time in making preparations for enjoying the triumph of witnessing in person the whole destroyed (*it is alleged* by a mixture of salt and lime) and then swept into the river. A letter of Mr. King, detailing these preparations, and the process of launching the drug into the water, has appeared in all the newspapers.<sup>3</sup>

Yet these excerpts taken from Warren and Allen read like a complete and coherent narrative of the event and say nothing of the salt and lime. Notice that the *Quarterly Review* says the use of salt and lime is *alleged*.

The *Times* of London published a much fuller extract from King's letters to Joseph Ballestier, Esq., the U.S. Consul at Singapore, on 1 November 1839. King prefaced his eyewitness account of the event with the proclamation by Lin in which he mentions he will use salt and lime. The first hand report of Charles W. King, as recorded by the *Times*, differs in punctuation and spelling and in one instance, a verb tense, with the accounts recorded by Warren (1840) and Allen (1853) but is overall closer to that of Warren. Allen says he derived his version from the *Asiatic Journal* while Warren seems to have received his version from the *Times*. One significant difference is that Allen has King say the value was twenty million rupees while the *Times* reports it as twenty million Spanish dollars.

King begins his personal report after recording Lin's proclamation on how the opium would be destroyed:

The sight of this proclamation confirmed me in my previous intention, to proceed to the Bogue, on the first arrival of a ship to my consignment, to witness the process of destroying the opium, and to seek a conference with the commissioner, respecting the existing and the apprehended difficulties. The Morrison coming in on the 14th, I proceeded in her the following day to the Bogue, with two friends, and on anchoring at noon, the 17th, sent a card to

---

<sup>3</sup> Gifford, William et al. "Chinese Affairs," *The Quarterly Review*, vol. lxxv, no. cxxx. London: John Murray, 1840, p. 556 (GB).



one of the naval officers of the Chuenpee station, asking the necessary permission. The card was duly conveyed to the commissioner, and the request promptly granted. At 10 a. m. (the 17th) we left the ship in our own boat, escorted by several barges, and proceeding up the channel east of the Bogue forts, some five or six miles, reached at 11 the spot where the drug is being destroyed, and where the commissioner has his temporary residence. We found the spot to be an enclosure of some 400 feet square, well palisaded, the side opposite (away from) the river being, occupied by neat buildings, for storing the opium, and etc. The larger part of the fore ground was covered by three vats of perhaps 75 feet by 150 each, opening by sluices into the river. The chests of opium, after being reweighed, and broken up in the presence of high officers, were brought down to the vats; the contents, ball after ball, broken down and crushed upon platforms, raised on high benches above the water, and then pushed by the feet of the Coolies into the receptacles beneath. A large number of men were employed in thus mascerating the balls for some days with long rakes, until the whole had become a fetid mud, when the sluices were raised, and the vats emptied into the river. Every precaution seemed to be used by the officers to insure the complete destruction of the drug, the spot being well-guarded, the workmen ticketed, and etc. In fact, we turned from the scene, fully satisfied that the work was being performed with rigid faithfulness, and much disposed to wonder, that while Christian Governments are growing and farming this deleterious drug, this Pagan monarch should nobly disdain to enrich his treasury with a sale that could not fall short of 20,000,000 Spanish dollars. Have we anywhere on record a finer rebuke administered by Pagan integrity to Christian degeneracy?<sup>4</sup>

King does not mention the use of salt and lime in this narrative either, a fact noticed by the *Quarterly Review* which explains their use of the word, *alleged*. Lin alleges salt and lime will be used, or were used, in his edict. But King, who was there, does not record seeing either substance. The obvious question becomes, did King not feel it was necessary to add these details since he prefaced the narrative of his visit with Lin's proclamation, or did King simply not feel these details were important enough to be included in his own

---

<sup>4</sup> King, Charles W. "Imperial Edict respecting the Surrendered Opium, the Process of Destroying it, and etc. (Extracts from Letters of C. W. King, Esq. of Canton to J. Ballestier, Esq.)," *The London Times*, 1 November 1839, Issue 17188, column C, p. 2, found at [http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2\\_TTDA\\_2\\_\\_11/1/1839](http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2_TTDA_2__11/1/1839); see appendix C.

account? Either way, his personal eyewitness testimony of the event does not include the use of either substance.

The section concerning the process itself is very brief. King had already written a much longer fictitious account involving a funeral pyre only two or three months earlier. Now he is confronted with a soaking not a burning, a putrefication not a purification, not a mythic cleansing but its prosaic opposite. He turns away rather quickly. He has other business.

King is not making a three-day round trip from Macao simply to see what happens to the opium. He is a merchant and, with the departure of the British and the cessation of trade, he wants "to make inquiries respecting the conditions, on which ships may hereafter enter the Bogue."<sup>5</sup>

He spends the rest of the afternoon in a conference with Lin:

We now passed to our audience with the commissioner through piles of broken opium boxes and coverings, the latter still bearing in full relief a mark well known to the Chinese throughout the empire - the mark of the Hon. East India Company. We found his Excellency in a temporary audience-room; supported on the right by the Admiral of the station, and on the left by the Hoppoo and the provincial judge, or Anchetse.<sup>6</sup>

First, there are the formalities, especially the avoidance of the dreaded *kowtow*:

We stood before the commissioner, but were permitted and requested to follow our own fashion as to ceremonies. His manner was kind and simple, and his fine, vivacious, and spirited countenance contrasted favourably with that of the square, hardfeatured Admiral, and of his heavy, unintelligent colleagues on the bench opposite.<sup>7</sup>

King begins by referring "to the inconveniences and losses sustained by the late proceedings" and he asks "whether any security would be given that such should not occur in future."<sup>8</sup> He

<sup>5</sup> *CR*, vol. 8, p. 70 (GB).

<sup>6</sup> King, the *Times*, 1 November 1839, <http://infotrac.galegroup.com>.

<sup>7</sup> King, the *Times*, 1 Nov 1839, [//infotrac.galegroup.com](http://infotrac.galegroup.com).

<sup>8</sup> *CR*, vol. 8, p. 75 (MD).

then inquires "for a specification of the conditions on which ships will henceforth be allowed to enter the port."<sup>9</sup> During the course of their conversation, King presents "two papers to the Commissioner, one referring to his own vessels, asking that they might enter and trade as formerly."<sup>10</sup> The second paper urged

that speedy reparation ought to be made for all losses that had been unjustly incurred, that ample security should be given that the like interruption of the regular trade should not again occur, and that it should be clearly proclaimed that it was only against the traffic in opium that severity is to be exercised.<sup>11</sup>

Besides this, King includes a laundry list of suggestions on how to improve trade, criminal justice, international diplomacy and living conditions for the foreigners. The papers are written in English and later returned because neither Lin nor his translators say they can read them:

After replying to his questions, if I had duly received his chop (addressed to me in March last), if I had seen the process of destroying the drug, and etc., my two petitions were presented. Unhappily I had relied on his having, as report said, an English translator with him, and had neglected to prepare a Chinese copy. He received the papers, and replied to the first, (which respected the concerns of the Morrison), that my business should go on without interruption, on the old footing. The second was a long paper, requesting certain ameliorations, and etc., calculated to remove the existing difficulties, and to avert the threatened hostilities. Our imperfect power of communicating (through the Canton dialect) did not allow us to discuss the petition article by article, and the conference turned chiefly on the approach of hostilities. He assured us, that whatever might be the course pursued by England, the legal traders of other nations should be carefully protected. We intimated that the Chinese power of protection did not extend beyond their own shores, but this, though fully admitted by our middle-men, was probably not stated to his Excellency. Many general questions and replies followed, and on leaving it was arranged that an answer to the petition should be given on the *Morrison's* return to Chuenpee, after obtaining her pilot. We regained the ship at 1/2 4 o'clock p. m., and were followed by the usual presents of

<sup>9</sup> *CR*, vol. 8, p. 75 (MD).

<sup>10</sup> *CR*, vol. 8, p. 76 (MD).

<sup>11</sup> *CR*, vol. 8, p. 76 (MD).

provisions, &c. After weighing anchor my petitions were brought off, with the report that the commissioner's attendants were unable to translate them, and it was further agreed that that office should be done by ourselves on the way to Macao, and the copies again sent up by the Morrison.<sup>12</sup>

## B. BRIDGMAN'S ACCOUNT

Bridgman says they arrived at Chunhow a little before eleven a.m. and then had a short wait until Captain Loo could announce their arrival.<sup>13</sup> As well as the time, Bridgman roughly confirms King's estimate of the outer palisade: "The site selected for the deposit and destruction of the opium, is on the bank of the creek, at the brow of a hill, a short distance from the north end of the village, including an area about 400 or 500 feet square, strongly impaled with bamboo."<sup>14</sup> His entire account reads sequentially, as if he were writing from notes he made at important moments during the afternoon. In this he acts as a good reporter, but it also suggests that his original estimate (and perhaps King's) of the extent of the first palisade, was made from creekside. Third, he confirms the existence of smaller enclosures (King calls them buildings) for the opium: "Another part of the officers superintended the delivery of the opium from the chests, which had been stored up in small enclosures within the large one."<sup>15</sup> He doesn't say where they are. He also confirms King's account of the extreme security and care that Lin's officers take in observing the work and recording and checking each chest.<sup>16</sup>

About the tanks, Bridgman contradicts Lin and confirms King. There are three tanks, not two, rectangular not square:

On the west side of the enclosure, just within the palisades, were three large vats or trenches, running from east to west, say 150 feet long, 75 feet broad, and 7 deep, flagged with stone, and lined along the sides with heavy timbers.

---

<sup>12</sup> King, the *Times*, 1 Nov 1839, //infotrac.galegroup.com.

<sup>13</sup> *CR*, vol. 8, p. 70-72 (GB); see appendix C.

<sup>14</sup> *CR*, vol. 8, p. 72 (GB).

<sup>15</sup> *CR*, vol. 8, p. 73 (MD).

<sup>16</sup> *CR*, vol. 8, p. 73 (MD).

Each of these three had its own fence, with entrances only on one side. When we were there, one had no opium in it; a second was being filled; and another was nearly ready to be emptied.<sup>17</sup>

From the time the *Morrison* anchors at Chuenpi and requests permission to observe the process until the time of the arrival of the foreigners at Chunhow, a full day passes. Lin has had time to prepare an instructive tableau illustrating his method: one tank with only water, one being filled with opium, one ready to be discharged. It is designed so as to draw conclusions.

Bridgman now does so, but carefully (*italics added*):

The process to which the drug was subjected, was briefly this. In the first place, a trench was filled two feet deep, more or less, with fresh water, from the brow of the hill. The first trench was in this state, having just been filled with fresh water. Over the second, in which the people were at work, forms, with planks on them, were arranged a few feet apart. The opium in baskets was delivered into the hands of coolies, who going on the planks carried it to every part of the trench. The balls were then taken out one by one, and thrown down on the planks, stamped on with the heel till broken in pieces, and then kicked into the water. At the same time, other coolies were employed in the trenches, with hoes and broad spatulas, busily engaged in beating and turning up the opium from the bottom of the vat. Other coolies were employed in *bringing salt and lime, and spreading them profusely over the whole surface of the trench*. The third was about half-filled, standing like a distiller's vat, not in a state of active fermentation, but of slow decomposition, and was nearly ready to be drawn off. This was to be done through a narrow sluice, opened between the trench and the creek. This sluice was two feet wide, and somewhat deeper than the floor of the trench. It was furnished with a *screen, made fine like a sieve*, so as to prevent any large masses of the drug from finding their way into the creek. Loo told us that the destruction of the opium, which commenced on the 3d, would be completed by the 23d. At first, he said less than 1000 per day were worked off; but the day we were there he thought the number would be nearly 1300 chests.<sup>18</sup>

Afterwards, Bridgman and King set off to the east side of the enclosure for a meeting with Lin while Captain Benson and

<sup>17</sup> *CR*, vol. 8, p. 73 (MD).

<sup>18</sup> *CR*, vol. 8, pp. 73-74 (MD).

Charlotte sit "near the boat in one of the watch-houses, where she was furnished with tea and sweetmeats."<sup>19</sup> Bridgman records no further inspection of the process.

### C. LIN'S ACCOUNT

Besides his memorials to the emperor, Lin left clues in his edicts and his diary. On 13 May, Waley says his diary records him inspecting the excavation of his new tanks. On 19 May he is composing his apology to the spirit of the sea "for polluting the sea with the opium that he now proposed to liquify"<sup>20</sup> in Waley's words, that "all aquatic animals might take refuge when the decomposed opium was thrown into the ocean"<sup>21</sup> in the words of Chang. In his proclamation late May or early June, he makes it official: he will mix the opium with lime and salt until it is "completely transmuted and destroyed" in the translation published by Bridgman.<sup>22</sup> In his diary, the entry for June 17 notes that his foreign visitors watched "the melting of the opium" and that day "we melted 1600 chests" according to Arthur Waley's translation.<sup>23</sup>

Lin's description of his new process is contained in two dispatches to the emperor. When he was half way through, he sent the first memorial from Canton 13 June 1839 and it was received in Peking 8 July 1839. He tells the emperor how he discovered his new method (*italics added*):<sup>24</sup>

After extensive inquiry and consultation, we came to learn that there are two things which are the deadly enemies of opium - salt and lime. It is observed by the purifiers of opium that when mixed with salt and lime in the process of purification, the opium will never yield the oily paste desired.<sup>25</sup>

---

<sup>19</sup> *CR*, vol. 8, p. 74 (MD).

<sup>20</sup> Waley, p. 44.

<sup>21</sup> Chang, p. 173.

<sup>22</sup> *CR*, vol. 8, p. 36 (MD).

<sup>23</sup> Waley, A. *The Opium War through Chinese Eyes*. London: George Allen and Unman, Ltd., 1958, p. 50.

<sup>24</sup> Chang, p. 174; Kuo, p. 244; see appendix C.

<sup>25</sup> Kuo, p. 245.

Though Kuo translates "salt and lime," the original online could be read as "two things: one is salt brine, the other is lime." The specific characters are *yan* (second tone, SWBT, 7810.7) and *lu* (third tone, EYWI, 3116.0). The first translates as salt and the second most often as "gravy, sauce, broth, salt or brine."<sup>26</sup> Later in the same memorial, Kuo translates "then salt is made to dissolve in the water." But the original reads literally not *cai2 che4* for "dissolve" but *sa3 yan2 cheng2 lu3* or "scatter salt, achieve brine."<sup>27</sup> Seemingly insignificant, this minor detail will become more important when considering the experiments conducted by European chemists with salt brines and opium in part three.

Lin describes his equipment:

We conferred with one another again and again and finally resolved that on the seashore two ponds be dug out to be used alternately for the purpose of destroying the said opium. Each of the ponds has a flat, stone-paved bottom, more than 150 feet each in length and width with boards on the four walls preventing the outlet of the melted drug. In front of the pond there is an exit to the sea; and in the rear an aqueduct. On the banks of the ponds there are fences which embrace seats for the officers of inspection.<sup>28</sup>

Next, he tells the emperor the basics of his new method (*italics added*):

As to the process of destruction, water is first conveyed into the ponds through the aqueduct; then *salt* is made to dissolve in the water; the opium, each piece broken into four parts, is thereupon thrown into the *salt water* to stay there

---

<sup>26</sup> CBYWSM (TK), volume 7, page 7a, line 10, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024402](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024402). Translations by [www.mdbg.net](http://www.mdbg.net), [www.mandarin-tools.com](http://www.mandarin-tools.com), [www.tigernt.com](http://www.tigernt.com), [www.yellowbridge.com](http://www.yellowbridge.com) and Morrison, R. *A Dictionary of the Chinese Language in Three Parts*. Part III. Macao, China: Printed at the Honorable East India Company's Press by P. P. Thoms, 1822, p. 53. *Lu*, without the water sign, can be translated as natural salt or rock which may explain the translation offered by Slade. It is also possible to confuse this character with *hai* (third tone) for sea, ocean.

<sup>27</sup> Kuo, p. 246; line 8, page 7b, volume 7 CBYWSM (TK) online.

<sup>28</sup> Kuo, p. 246.

for half a day; and finally *whole pieces of thoroughly heated limes* are thrown into the mixture. *It instantly boils, burning by itself.*<sup>29</sup>

Kuo translates opium thrown into salt water but Lin writes in the original opium thrown into brine (*lu3*). The opium soaks or steeps (*pao4 jin4*) for half a day. Entire lumps (*zheng3 kuai4*) of thoroughly roasted (*shao1 tou4*) limes are then thrown in. Quickly, the mixture appears as if (*bian4 ru2*) a boiling soup (*tang1 fei4*). Literally, it burns by itself (*zi4 ran4*) or in a spontaneous combustion.<sup>30</sup>

Lin discusses the logistics of the process:

Meantime, a number of laborers are hired to stir inside the pond with their plows so that every particle of the drug shall be melted away. At the time of the receding tide, the front exit is opened to let out the melted matter, and clean water is introduced to wash the bottom of the pond so that not an iota would be suffered to stay. If one pond cannot be cleaned on day A, then the other would be used on day B. The same process of dissolving, mixing, melting, and stirring is followed. Only by so doing - cleaning the bottom of a pond whenever using it - is it possible to prevent cheating or abuse. ... At the time of dissolving, the thick oily part floats on the surface, while the siftings sink down. A particularly repugnant smell comes out from it, making people seek to avoid the ponds.<sup>31</sup>

In a second memorial to the emperor sent 5 July and received<sup>32</sup> in Peking 28 July 1839, Lin and his colleagues describe the end of the process (*italics added*):

Since that time we have followed the same method of first breaking the chest, then weighing the opium, then cutting it into pieces, and finally throwing it into the pond to be *mixed with salt water and dissolved by lime*. In all, we wait till all has been thoroughly destroyed and then sent to the sea at the time

<sup>29</sup> Kuo, p. 246.

<sup>30</sup> CBYWSM (TK), volume 7, page 7b, lines 8, 9 and 10, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024402](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024402). Translations from [www.mdbg.net](http://www.mdbg.net), [www.mandarintools.com](http://www.mandarintools.com), [www.yellowbridge.com](http://www.yellowbridge.com) and Mao Jin Li, editor, et al. *Diccionario Moderno Español-Chino Chino Español*. Beijing: *Wei Yu Jiao Xue Yu Yan Jiu Chu Ban She*, 1991, p. 304.

<sup>31</sup> Kuo, p. 246.

<sup>32</sup> Chang, p. 174; Kuo, p. 248.



of the receding tide. ... The net weight of the opium, not counting that of the chests and bags, is 2,376,254 catties, all of which were destroyed by the fifteenth day of the fifth month (June 25, 1839).<sup>33</sup>

In this second memorial, he describes for the Emperor the visit of the foreigners:

Therefore we sent officers to escort them to the ponds and let them fully acquaint themselves with the methods of cutting opium, dissolving, melting, and destroying it. The said barbarians all nodded their heads at the spectacle and also constantly covered their noses with their hands against the smell. They finally came to us, taking off hats and shaking hands with us as if expressing their willingness of submission.<sup>34</sup>

Lin never mentions the screen on the exit of pond number three.

#### D. DISCUSSION

These three eyewitness accounts are why the Salt, Lime and Water Tale is given so much credence by careful investigators. Those interested can read the complete accounts in Appendix C. There do not appear to be any other written eyewitness barbarian accounts. Nor is it easy to discover any other written eyewitness Chinese accounts from the 600 or so observers who must have witnessed the process. As a result, what is known of what Lin did with the opium comes, at present, from these three. Yet the conflicts among them are not only obvious but extensive. Here are three very different accounts of the same event by three eyewitnesses who were there, present on the scene, on the same day, at the same time, and who therefore must have been looking at the same thing happening before their eyes. This is so curious that it is worth the time to examine in some detail the various discrepancies.

---

<sup>33</sup> Kuo, pp. 248, 250; see appendix C.

<sup>34</sup> Kuo, pp. 248-249.

X  
COMMONALITIES AND FAULTS  
IN THE EYEWITNESS ACCOUNTS

---

- X. COMMONALITIES AND FAULTS  
IN THE EYEWITNESS ACCOUNTS
  - A. COMMON TO THE EYEWITNESSES
    - 1. PERSONAL PREJUDICE
    - 2. PROFESSIONAL PREJUDICE
  - B. COMMON TO THE EYEWITNESS ACCOUNTS
    - 1. WHO
    - 2. WHEN
    - 3. WHERE
    - 4. WHAT
    - 5. HOW
    - 6. WHY
  - C. FAULTS IN THE RECORD
    - 1. WHAT THE FOREIGNERS DIDN'T SEE
    - 2. THE GRAND BARBARIAN TOUR
  - D. DISCUSSION

**B**EFORE discussing the differences in their accounts, it is equally important to notice what all three eyewitnesses have in common, what their accounts have in common and the faults in the record itself.

A. COMMON TO THE EYEWITNESSES

The three eyewitnesses share a number of personal and professional opinions. These shared beliefs need to be considered before discussing what their stories have in common. The quantity and extent of said similar opinions will help determine whether

these eyewitnesses can be considered typical or merely typical of a particular class.

## 1. PERSONAL PREJUDICE

All three eyewitnesses share very publicly expressed, personal prejudices against opium, opium smoking, and the opium trade. In his first edict to the foreigners Lin refers to opium as a "nauseous poison" and, in his first letter to the queen, that opium smokers take a "deadly poison" leading to "the destruction of their persons, and the draining of their resources."<sup>1</sup> In the second letter to the queen he tells her that opium traders "shall most assuredly be put to death!"<sup>2</sup>

King warns that opium "is insinuating itself into the habits of a morbid portion of Western society" and calls opium smoking a "vicious indulgence." He claims he was always "averse to the opium traffic" and that "I sent in to the Commissioner my individual assurance of entire freedom from the traffic and received in reply a full exoneration."<sup>3</sup>

Bridgman thinks the "evils resulting from the use of opium" are "much greater - than those caused by the use of alcoholic liquors." He agrees with the description of opium smoking "as one of the worst evils, as the greatest calamity" and writes that the "*victimized*" opium smoker is the most wretched being we ever beheld (*italics* Bridgman)." The opium traffic he calls "the fruitful source of evils, destroying life, property and morals."<sup>4</sup>

---

<sup>1</sup> *CR*, vol. 7, p. 612 (MD); *CR*, vol. 8, p. 10 (MD).

<sup>2</sup> *CR*, vol. 8, p. 502 (MD).

<sup>3</sup> King, Charles W. *The Opium Crisis*. London: Edward Suter, 1839, p. 20, 24, 25, 58 (GB).

<sup>4</sup> Bridgman, E. C. "Remarks on the Present Crisis in the Opium Traffic," *CR*, vol. 8, pp. 3-4 (MD).

## 2. PROFESSIONAL PREJUDICE

Besides these deeply held and openly expressed personal prejudices, each also had professional reasons to desire that the opium should appear to be destroyed.

Lin, of course, was under specific instructions from the emperor to destroy it in the presence of others.<sup>5</sup> It was not simply necessary to destroy the opium but the emperor had commanded Lin to assemble the civil and military officers to witness the destruction. With such explicit instructions and so much wealth in the balance, how much the emperor in Peking actually trusted the commissioner in Canton is a question worthy of some debate.

King's previous prediction of a funeral pyre would be vindicated and his position as a non-trader in opium justified if the opium were at least in some way destroyed. In King's own words after his tour of the site at Chunhow (*italics added*):

*Having long ago staked my judgment on the side of the sincerity of the Imperial Government, as to the suppression of the traffic, I am not disappointed at a scene which others have ridiculed in prospect, but which I have now witnessed.*<sup>6</sup>

More importantly, King has business to discuss with Lin and thus good financial reasons not to question too closely the process.

Western missionaries blamed the opium trade for their inability to convert the Chinese. The Reverend A. S. Thelwall, for example, asked:

Can it be doubted but that the name and profession of Christianity is grossly dishonoured by the fact (well known throughout Eastern Asia), that those who profess and call themselves Christians are systematically and perseveringly engaged in this iniquitous and poisonous traffic?<sup>7</sup>

---

<sup>5</sup> *CR*, vol. 8, p. 36 (MD).

<sup>6</sup> King, the *Times*, 1 Nov 1839, <http://infotrac.galegroup.com>.

<sup>7</sup> Thelwall, Algernon Sydney. The Iniquities of the Opium Trade with China. London: W. H. Allen and Co., 1839, p. 173 (GB).

"The main argument against Christianity," wrote Dr. Medhurst, is "that its professors vend opium."<sup>8</sup> A resident missionary at Macao, David Abeel, called the traffic in opium "one of the most appalling obstacles to the missionary exertions."<sup>9</sup> But whether the missionary-publisher Bridgman shared this professional prejudice is unclear.

## B. COMMON TO THE EYEWITNESS ACCOUNTS

Besides the many points in their reports which contradict one another, there are points upon which they all agree. There are not many because in comparing a number of stories for points of common agreement, the barest record will limit that accord and King's account is the shortest and most incomplete. Nevertheless, there are points in each account that are confirmed by the other two. By looking at only those points of common agreement, it is possible to form a bare minimum from which to form further judgments. This may seem extreme but it is first important to establish a minimum of agreement among the differing stories of what happened or did not happen at Chunhow in June 1839.

### 1. WHO

All agree that King and Lin were present with some officers and workmen. Bridgman was there, he wrote an account of his visit, and Lin noticed him in the party of foreigners. It is King who does not mention him or any other Westerner or Easterner by name in his report. This is an oddity of King's story; the other two reports do not suffer such exclusion. Nevertheless, judged strictly and solely by what all three of the accounts themselves agree upon, Bridgman must be excluded.

---

<sup>8</sup> "The opium trade - Medhurst's voyage in the American brig *Huron*," *Canton Register*, vol. 11, Thurs. Oct. 30, 1838, no. 44, pp. 175-176.

<sup>9</sup> *The Baptist Missionary Magazine*, vol. 20. Boston, MA: Board of Management of the Baptist General Convention, 1840, p. 273 (GB).

All three accounts suggest that the hoppo and the admiral were present.

2. WHEN

All agree that the inspection by the barbarians occurred on the morning of 17 June 1839.

3. WHERE

All agree that the site was in the vicinity of the Bogue.

4. WHAT

All agree that the barbarians came from Macao, asked permission to visit and were escorted to the site. The site was fenced, guarded and the opium was stored in enclosures inside the fence. There were at least two vats and one of them had an exit. The workmen were searched.

5. HOW

Opium was soaked in water for some period of time. King, as noticed earlier, did not record the use of salt or lime.

6. WHY

The ostensible purpose was to destroy the opium.

C. FAULTS IN THE RECORD

Before examining the various contradictions in the eyewitness reports, it is important to examine the record itself, specifically what is missing from, what cannot be true in, and the timeframe of each of the barbarian reports since they had the least amount of time to inspect the process.

## 1. WHAT THE FOREIGNERS DIDN'T SEE

King doesn't see workmen (*italics added*) "mascerating the balls *for some days*."<sup>10</sup> He was only there at Chunhow for an afternoon. He is relating what he believes, concludes or surmises but not what he himself has seen personally. How long the opium is mascerated is not something he witnesses, it is a conclusion he draws, something he believes to be true upon the word of another. This makes suspect what follows: "until the whole became a fetid mud, when the sluices were raised, and the vats emptied into the river."<sup>11</sup> Did King witness personally the emptying of a vat or is this what he believes will happen "some days" in the future? For contrast, Bridgman doesn't see tank three actually discharged, noting only that it was "nearly ready."<sup>12</sup>

King says the broken chests of opium were "brought down to the vats."<sup>13</sup> King describes the scene as if work is proceeding on all three vats. Bridgman doesn't see any work being performed on tanks one or three.<sup>14</sup> King probably did *not* see the opium brought down to vats one and three.

Bridgman says all three tanks were lined with stone. Bridgman probably does *not* see the flagged stone on the bottom of vats two and three as these would have been covered over with two to three feet of an opaque brown water and King's "fetid mud."<sup>15</sup> He could have observed the stone through the clear water in tank one and surmised the others were similarly constructed.

Bridgman does not notice the separation of the opium into a floating oil and a sinking precipitate though he does see tank three in a state of decomposition. Bridgman does not record the effect of the "thoroughly heated limes" when they are thrown onto the water. This dramatic boiling recorded by Lin is conspicuously missing from Bridgman's narrative. Bridgman also does not notice that the limes

---

<sup>10</sup> King, in Allen, p. 48 (GB).

<sup>11</sup> King, in Allen, p. 48 (GB).

<sup>12</sup> Bridgman, *CR*, vol. 8, p. 74 (MD).

<sup>13</sup> King, in Allen, p. 48 (GB).

<sup>14</sup> King, in Allen, p. 48 (GB); Bridgman, *CR*, vol. 8, pp. 73-74 (MD).

<sup>15</sup> King, in Allen, p. 48 (GB).

have been heated or where the heat comes from, whether from fires or kilns. The salt and lime arrive at the site at Chunhow, origins unexplained by Bridgman and Lin. Bridgman does note a number of small boats on the river busily engaged in some kind of industry. All three record the laborers being searched as they left the enclosed, palisaded site.

## 2. THE GRAND BARBARIAN TOUR

The two western accounts are based upon a very brief inspection. King and Bridgman left Macao on the afternoon of 15 June, arrived at the island of Chuenpe at the Bogue about noon on 16 June.<sup>16</sup> There they waited for permission to visit. This is according to Bridgman.

King's account, as noticed earlier from the *Times*, contains a contradiction as to when they arrived (*italics added*):

The Morrison coming in on the 14th, I proceeded in her the following day to the Bogue, with two friends, and *on anchoring at noon, the 17th*, sent a card to one of the naval officers of the Chuenpee station, asking the necessary permission. The card was duly conveyed to the commissioner, and the request promptly granted. *At 10 a. m. (the 17th) we left* the ship in our own boat ....<sup>17</sup>

Since it is clearly impossible for King to have anchored at noon on the 17th, sent a card and received permission at 10 a.m. of the same day, this can only be assumed to be a typo in the *Times* or an error in King's report, the latter meaning King would be trying to make it seem as if permission were granted more quickly and easily than it was. The typo is the most generous explanation. In fact, they had to have anchored at Chuenpe at noon on the day before, the 16th, which is confirmed by Bridgman.

Permission granted, both Bridgman and King say they left the *Morrison* at 10 a.m. on 17 June. They arrived at Chunhow "in less

---

<sup>16</sup> *CR*, vol. 8, p. 70 (GB).

<sup>17</sup> King, the *Times*, 1 Nov 1839, //infotrac.galegroup.com.



than an hour."<sup>18</sup> After a short delay, they entered the enclosure about 11 a.m.<sup>19</sup>

By 11:30 a.m., they were done: "By half-past eleven o'clock, we had examined, and reexamined every part of the process of destruction."<sup>20</sup> In King's words, "we turned from the scene fully satisfied."<sup>21</sup> In all, the missionary and the merchant, his wife and the captain, spent a full *half-hour* during their grand inspection tour.

King and Bridgman occupy at least the next two hours (with their backs turned to the palisaded tanks) on the east side of the enclosure in a conference with Lin and other officers in his pavilion.<sup>22</sup> Most second hand reports of the visit of the barbarians suggest that the purpose of their visit was to observe Lin's new process for the confiscated opium. Judging only by how long the two spent at the tanks compared with their time in conference with Lin, it may be more accurate to describe their visit as an extended business trip with a side glance at the process itself.

#### D. DISCUSSION

The eyewitnesses are admittedly prejudiced, personally and professionally, against opium. Considering the several hundred foreign traders and many thousands of Chinese who were actively involved in the opium trade and who did not share such prejudices, this group of eyewitnesses can only be considered special and their reports must be labelled non-typical. When they bother to mention important details, they record their suppositions not their observations. Two of the three eyewitness accounts are based upon a very, very brief and perfunctory inspection. They agree only that opium was soaked in water for a period of time at a site near the Bogue on 17 June 1839 in the presence of some officers and workmen. Next are the contradictions in their reports.

---

<sup>18</sup> *CR*, vol. 8, p. 71 (GB).

<sup>19</sup> *CR*, vol. 8, p. 72 (GB); Warren, p. 11 (GB).

<sup>20</sup> *CR*, vol. 8, p. 74 (MD).

<sup>21</sup> Allen, p. 48 (GB).

<sup>22</sup> *CR*, vol. 8, p. 75 (MD).

XI  
CONTRADICTIONS IN THE EYEWITNESS  
ACCOUNTS

---

- XI. CONTRADICTIONS IN THE EYEWITNESS ACCOUNTS
  - A. WHO
  - B. WHEN
  - C. WHERE
    - 1. THE DELIVERY
    - 2. THE STORAGE
    - 3. THE PREPARATION
    - 4. THE PROCESSING
    - 5. THE SOURCES
  - D. WHAT
    - 1. THE ARRIVAL OF THE BARBARIANS
    - 2. THE TANKS
    - 3. THE VANTAGE POINT
    - 4. THE SLUICE(S)
    - 5. THE SCREEN(S)
    - 6. THE DEPARTURE OF THE BARBARIANS
  - E. HOW
    - 1. THE INGREDIENTS
    - 2. THE METHOD
    - 3. THE RESULT
      - a. THE SEPARATION
      - b. THE BOILING AND BURNING
      - c. THE SMELL
      - d. THE QUANTITY
  - F. WHY
  - G. DISCUSSION AND QUESTIONS
    - 1. THE SOURCES
    - 2. THE TANKS
    - 3. THE LOCATION
    - 4. THE METHOD
    - 5. THE RESULT

HAVING noticed their common prejudices and the faults in the record, can some truth be sieved from these three different eyewitness accounts if a note is carefully made of each discrepancy? The magnificent cinematographer Akira Kurosawa suggests this is not possible when eyewitness reports of the same event conflict.<sup>1</sup> The particular event in question is the processing of the barbarian opium in the vicinity of the Bogue on or about the morning of 17 June 1839. Before speculation and good judgment should be attempted as to just what took place or didn't, it might be useful to compare these three accounts carefully as to just what was recorded and what wasn't.

#### A. WHO

Which of the foreigners was present at the site on 17 June 1839 should be a matter of common agreement in their respective accounts but it isn't.

Bridgman saw "crowds of spectators" and "two divisions of troops, in full uniform" and writes: "The number of workmen was said to be about five hundred. The number of officers, civil and military, could not have been less than sixty or eighty."<sup>2</sup> Specifically, Bridgman notes "Loo Taeyuë, a naval officer of the rank of captain" who was "our guide" and "his friend, Wongchin."<sup>3</sup> At the conference after their very brief inspection were Lin, the admiral on his right and the hoppo and commissioner of justice to Lin's left.<sup>4</sup> Bridgman records only one female in their party, the wife of Charles King, Charlotte, their party consisting of "Mr. and Mrs. King, Captain Benson, myself and six seamen."<sup>5</sup>

---

<sup>1</sup> Specifically, with the masterpiece *Rashomon* (In the Woods) 1950, based upon two short stories by Ryunosuke Akutagawa entitled *Rashoman* and *Yabu no naka*. See [www.imdb.com/title/tt0042876](http://www.imdb.com/title/tt0042876), e.g.

<sup>2</sup> Bridgman, *CR*, vol. 8, pp. 72 (GB) and 73 (MD).

<sup>3</sup> Bridgman, *CR*, vol. 8, pp. 71-72 (GB) and 73 (MD).

<sup>4</sup> Bridgman, *CR*, vol. 8, p. 75 (MD).

<sup>5</sup> Bridgman, *CR*, vol. 8, p. 71 (GB).

As if to shed some light on King's explanation for the rejection of his papers (that Lin's linguists could not read them), Bridgman adds a postscript noticing that Lin had in his employ "four natives, all of whom have made some progress in the English tongue" and that one was "able to read and translate papers on common subjects, with much ease, correctness, and facility."<sup>6</sup> But whether they were there also is unclear. King says they weren't.

King does not mention either his wife or Benson or even Bridgman, only that he came "with two friends."<sup>7</sup> King doesn't notice the spectators or the troops but does record that "a large number of men were employed," calling them "coolies," and also the presence of "officers." King notices the same functionaries at the conference afterwards as Bridgman: "We found his Excellency in a temporary audience-room, supported on the right by the Admiral of the station, and on the left by the Hoppoo and the provincial judge, or Anchetee."<sup>8</sup>

Kuo says that Lin tells the emperor about the barbarians (*italics added*): "And also the American merchants, King, Bridgman, *and others*, together with their families ...."<sup>9</sup> Kuo translates "and others" but the original document online specifically notices the presence of *Pien-sun* (Captain Benson of the Morrison).<sup>10</sup> In contrast, Waley says Lin uses "ladies" in his diary (*italics added*): "the foreigner King, with some *ladies* in his party."<sup>11</sup> Lin also sees the "inhabitants of the coastal regions" and "spectators" as well as "civil and military officers" and hired "laborers."<sup>12</sup>

---

<sup>6</sup> Bridgman, *CR*, vol. 8, p. 77 (MD).

<sup>7</sup> King, the *Times*, 1 Nov 1839, p. 2, //infotrac.galegroup.com.

<sup>8</sup> King, the *Times*, 1 Nov 1839, p. 2, //infotrac.galegroup.com.

<sup>9</sup> Kuo, p. 248, *italics added*.

<sup>10</sup> Chang, p. 308; CBYWSM (TK), volume 7, page 18b, line 6, from www.cadal.zju.edu.cn/Reader.action?bookNo=02024402.

<sup>11</sup> Waley, p. 50.

<sup>12</sup> Lin, in Kuo, pp. 246-249.

## B. WHEN

Both Bridgman and King write that the date of their half hour inspection tour took place on 17 June 1839.<sup>13</sup> Lin writes (according to Kuo) in his second memorial from Zhenkou to the emperor that the barbarians arrived near "the time of the dragon festival" which would have been held 15 June 1839.<sup>14</sup> But he records a diary entry translated by Waley for 17 June 1839 that notices the arrival of the barbarians that morning.<sup>15</sup>

The party of foreigners did not arrive until almost 11 a.m. according to Bridgman, who was noting his watch as well as his compass during the trip; King concurs.<sup>16</sup> Lin's diary entry for 17 June has the foreigners arriving at 9 a.m. As for this discrepancy over the arrival time, it is Waley's translation of Lin's diary entry for 17 June that supposes the "Hour of the Snake" is 9 a.m.<sup>17</sup> Dr. Chang suggests that this reference is not so precise and he translates Chinese times more broadly: "... in the early hours of *ch'ou* (1-3 a.m.) ... in the early afternoon (the hours of *wei*, 1-3 p.m.) ... (and) the hours of *ssu* (9-11 a.m.)."<sup>18</sup> This might help explain the difference between Lin's diary entry and the reports of the foreigners as to the exact time they arrived.

## C. WHERE

Where was the site located? There is a curious, significant and generally unremarked upon discrepancy between the Western and Eastern accounts as to the location of the tanks. Both Bridgman and King describe a visit to a site close to the village of Chunhow. Lin does not name the site specifically in his memorials to the

<sup>13</sup> King, the *Times*, 1 Nov 1839, p. 2, //infotrac.galegroup.com; *CR*, vol. 8, p. 71 (GB).

<sup>14</sup> Lin, in Kuo, p. 248.

<sup>15</sup> Waley, p. 50.

<sup>16</sup> *CR*, vol. 8, pp. 71-72 (GB); Warren, Samuel. *The Opium Question*. London: James Ridgway, 1840, pp. 11-12 (GB).

<sup>17</sup> Waley, p. 50.

<sup>18</sup> Chang, pp. 162, 163, 165.

emperor. Lin's dispatches to the emperor make it appear as if the tanks are located at Chuenpi or Lankit, not Chunhow, though he carefully does not appear to have mentioned the exact location. It is worth considering this contradiction in some detail.

## 1. THE DELIVERY

To recap briefly once more, Lin issued his demand for the opium 18 March 1839. Superintendent Elliot commanded the British to surrender it on 27 March. Lin issued a list of rules for the delivery of the opium on 28 March that specified that the opium aboard the 22 store ships, any other foreign ships in the vicinity or in the foreign factories was to be brought to "the Sandyhead offing (one of the headlands of the Bogue)" also called "the port of Sandy-head."<sup>19</sup> W. Bernard, using in part the notes of Captain W. H. Hall, R. N. of the *Nemesis*, describes Chuenpee in 1841:

(It is) distinguished at a considerable distance by a high peak (and) on either side of (a projecting headland) is a fine sandy beach, off which there is a good anchorage. This is Chuenpee. ... (Above) is a watchtower (and) a considerable stone battery and other works. ... The whole of the country which borders the river is mountainous and picturesque.<sup>20</sup>

But Sandy-head may be distinct from the beach and anchorage at Chuenpee.

Fay adds a detail that the opium was initially received not at Chuenpe but Lankit (Lankeet or *Lung-hsueh*), a tiny island five miles below the Bogue, but that "(e)arly in the business, rough water at Lankit forced a removal to Chuenpi, at the edge of the Bogue."<sup>21</sup> Dr. Chang confirms Fay in that a "number of large chopboats left

<sup>19</sup> Slade (1839), pp. 69-70 (GB). For why Elliot surrenders it, see Chang pp. 69, 165-167; Chung, p. 200.

<sup>20</sup> Bernard, W. D. *The Nemesis in China*. 3rd edition. San Francisco, CA: Chinese Materials Center, 1974, p. 79 (reprint of the original in London by Henry Colburn of 1847).

<sup>21</sup> Fay, p. 157.

Canton on the 5th (of April) for Lung-hsueh (Lankit, *Longxue*) to participate in the receiving work."<sup>22</sup>

Lin left by boat from Canton on 10 April and "arrived at the Bogue" on 11 April.<sup>23</sup> There he personally supervised the collection and examination of the opium delivered up from the English receiving ships. Lin records in his diary for 11 April: "Today fifty chests of opium were received."<sup>24</sup> Chang writes that these were the first fifty chests delivered: "On the first day, it was slow, only fifty chests being taken over."<sup>25</sup>

The British store-ships were therefore initially required to sail from Macao or Hong Kong on the seacoast up the bay of Canton to the island of Lankit, some five miles below the mouth of the Bocca Tigris, the Bogue, a distance of between forty to sixty miles. Later, when the delivery site was changed, they were required to proceed five miles further to the island of Chuenpi on the Bogue. There, in the main channel, the opium was delivered "from the English ships to small boats, and from the small boats to the point near Chuenpi (an island on the east side of the Bogue) where it was to be accumulated."<sup>26</sup>

So, there is good evidence that the opium of the foreigners was first delivered into the possession of the Chinese at the island of Lankit and very quickly afterwards this point of transfer or delivery was changed to Chuenpe.

## 2. THE STORAGE

There were Chinese forts on the island above Chuenpe and Matheson reports this is where some of the opium was stored, at least temporarily.<sup>27</sup> In his letter of 13 June to the emperor, Lin also makes it appear as if the opium were still at Chuenpi (*italics added*):

---

<sup>22</sup> Chang, p. 168.

<sup>23</sup> Kuo, p. 241.

<sup>24</sup> Waley, p. 40.

<sup>25</sup> Chang, pp. 168-169.

<sup>26</sup> Waley, p. 40.

<sup>27</sup> Matheson to Jardine, 1 May 1839 in Le Pichon, Alain. China Trade and Empire. Oxford, England: Oxford University Press, 2006, p. 357 (GB).

Since we, your ministers, had received the surrendered opium, we considered it of supreme importance to guard against the possible plots of lawless persons, as the Bogue is very near to the seacoast. We therefore first set out to find a proper place for storing the opium. As each chest is about three feet long and half that in both height and width, a large house can accomodate only about four or five hundred chests. Further, the people's houses and temples in that locality [*Chuenpi, on the Bogue*] are all small and we found it necessary to put several buildings together, encircling them with a fence and covering them with a high roof.<sup>28</sup>

It is Kuo who inserts "Chuenpi, on the Bogue" in square brackets.

First Lt. Bingham of the *Modeste* attests to the presence of an important temple at Chuenpee:

On the 12th, the squadron moved nearer to the forts at Chuenpee, where they commenced watering at a small rivulet that discharged itself into the river on the south side of the point, near which a temple is situated, dedicated to the goddess .... [And he adds a note] ... The goddess Teen-fe, or Matsoo-poo, is also the deity of Chinese seaman ... declared the safeguard of the nation, the assister of the people, the excelling spritual essence ... the celestial Fe.<sup>29</sup>

Waley says that on 14 April, Lin "went to the temple of the Queen of Heaven, protectress of sailors, and the shrine of Kuan Ti, God of War, and burnt incense."<sup>30</sup>

But if the opium was stored at Chuenpe (the place where it was predominantly delivered), it must have remained there only a short time. There is also much evidence that the opium was very quickly moved from Chuenpe to Chunhow. In his earlier letter sent 12 April (one day after he began to receive it), Lin suggested to the emperor the opium be sent to Peking (*italics added*): "And considering the fact that the opium surrendered by the barbarians is unique in its amount, it seems natural that the original chests should be moved to Peking to be duly examined and *burned*."<sup>31</sup> In the same memorial he tells the emperor that (*italics added*) "the number of chests was

<sup>28</sup> Kuo, p. 245.

<sup>29</sup> Bingham, p. 419, vol. I (GB).

<sup>30</sup> Waley, p. 40.

<sup>31</sup> Kuo, p. 242.



very great. Those on board one storeship need scores of cargo boats to accomodate and ship them. And further, *the distance from outside the Bogue to the place of storage inside it was about ten miles.*"<sup>32</sup>

Because Lin does not name the place of storage specifically, there are three possibilities: he could be referring to the initial transfers from Lankit to Chuenpi or to the transfers from Chuenpi to Chunhow (which apparently happened relatively soon after the original delivery) or to a delivery direct from Lankit to Chunhow. The original online has *shi2 li3*, or ten *li*, that is, ten Chinese miles.<sup>33</sup> As noted earlier (p. 70n29), a *li* varied in late Ch'ing China, perhaps from three to three and a half *li* per English mile. The maps given by Chang and Fay estimate the distance from Lankit to Chuenpi<sup>34</sup> as well as from Chuenpi to Chunhow at roughly five miles. Bridgman made the latter journey in the *Morrison's* gig and also estimated the distance at five or six English miles (italics added):

When east of Anson's bay, having a little islet on our right, and the ruins of an old fort on the left, we passed through Sankow (the three mouths of the creek), and over Shakeo (sandy point), and with fair wind and tide reached Chunhow, in less than an hour from the time of leaving the ship. *Chunhow is, I should think, five or six miles from the fort on Chuenpi,* and nearly due east, distant about two miles from the fort on Anunghoy. From the islet above mentioned, our course was northeast up a small creek, with hills and dales, ricefields and rivulets on each side.<sup>35</sup>

The satellite photos suggest something more in the range of three or so English miles (as the crow flies) would be more appropriate.

Lin uses the terms *kou3 wai4* (outside the mouth) and *kou3 nei4* (inside the mouth) to describe the initial transfers. Lankit Island would have been *below* the Bogue. Chuenpi would have been

<sup>32</sup> Kuo, p. 237.

<sup>33</sup> CBYWSM (TK), vol. 6, page 15a, line 6; see p. 70n29 for dimensions of a *li*.

<sup>34</sup> Fay, pp. 16, 157; Chang, p. 59.

<sup>35</sup> Bridgman, *CR*, vol. 8, pp. 71-72 (GB).

on or at and sometimes just *outside* or *below* the Bogue. Chunhow would have been *within* or *inside* the Bogue (see p. 143n61).

P. C. Kuo adds a note in square brackets to his translation of Lin's letter to the emperor sent when he was half finished processing the opium suggesting the opium was stored at Chuenpe, where it was delivered. But earlier in the same book, Kuo writes (*italics added*): "The surrendered opium was all delivered by May 21. It was stored temporarily at *Chenkow*, on the Bogue."<sup>36</sup> Kuo cites the *Chinese Repository*, volume eight, pages 14 and 15. The word *Chenkow* does not appear on either of these pages of Bridgman's *Repository*. Bridgman does not use the spelling *Chenkow* but rather *Chinkow* or *Chunhow*, and none of the three appears on either page.<sup>37</sup> On the same page (116), Kuo also writes "the foreigners had long been blessed with the 'dewy benevolence' of the Chinese empire" and again cites the *CR*, volume eight, pages 19-20. But Bridgman writes on page 19 of that volume "deep benevolence."<sup>38</sup> Bridgman does write two dozen pages later in the same volume: "The delivery of the 20,283 chests of opium was completed on Tuesday, the 21st, at 2 o'clock a. m., and all safely stored in buildings prepared for its reception, at *Chinkow* near the Bogue, there to await further orders from Peking for its disposal."<sup>39</sup> Bridgman does not record where he received his information.

Dr. Chang writes: "On May 18, the opium delivery was completed (at Chuenpi)."<sup>40</sup> But Chuenpi, and before that Lankit, is only where the opium changed hands, from the English store-ships to the Chinese chop boats. It is important here to notice what Lin did not do, which would have been the most logical, to load the opium aboard smaller Chinese vessels and sail it further up the river to Whampoa or Canton, storing it in some guarded government compound like "the place of the military parade" where Chinese opium was burned in December 1837<sup>41</sup> or the depository for Chinese

<sup>36</sup> Kuo, p. 116.

<sup>37</sup> Bridgman, *CR*, vol. 8, index, pp. 14, 15 (GB).

<sup>38</sup> Bridgman, *CR*, vol. 8, p. 19 (GB).

<sup>39</sup> Bridgman, *CR*, vol. 8, p. 28 (GB).

<sup>40</sup> Chang, p. 171.

<sup>41</sup> *CR*, vol. 6, p. 400 (MD).

opium opened 15 March 1839 near the temple of longevity<sup>42</sup> while he awaited a reply to his 12 April memorial to the emperor.

Instead, he offloads it onto smaller boats and moves the opium from first Lankit, and then later Chuenpi, off the main shipping channel over the sandy point and up the same small creek (in Bridgman's report some five or six English miles) to just north of the small village of Chunhow. Instead of storing it in some already constructed building or buildings, Lin builds a large number of storehouses in a new purpose-built compound.<sup>43</sup> Since Chunhow is where the opium was eventually soaked in the tanks with water, salt and lime, this suggests that Commissioner Lin may have already conceived of his new method as early as 12 April. Whenever he made his decision, his diary definitely has him inspecting the trenches at Chunhow on 13 May.<sup>44</sup>

Remembering Bridgman's description of the trip in the *Morrison's* gig, at least part of the reason Lin may have moved it out of the main channel is simply for security. He shows his awareness of the limitations of English ships in a memorial to the emperor received 24 September 1839: "They can scarcely move in shallow waters or near sand bars. Hence, when their merchant vessels enter the port, they must employ natives as pilots, paying them with great sums of money."<sup>45</sup> There is some question as to whether he expected the British (or the Americans, for that matter) to try to steal it back, since they had surrendered it "voluntarily" (at threats to their lives while being held hostage).

So it appears the opium was stored temporarily at Chuenpe (where it was delivered) but that it was quickly moved to Chunhow.

### 3. THE PREPARATION

On 2 May, the emperor receives Lin's letter of 12 April and consents to Lin's idea of a transport plan though his reply does not

---

<sup>42</sup> Shuck, p. 80 (GB).

<sup>43</sup> Kuo, p. 245.

<sup>44</sup> Chang, p. 173; Waley, p. 42.

<sup>45</sup> Kuo, p. 251.

reach Lin until 24 May.<sup>46</sup> But long before his letter can arrive at Canton, the emperor changes his mind. He receives on 8 May "a memorial from Teng Ying, a censor of the Chekiang circuit, pointing out the infeasibility of such an undertaking."<sup>47</sup> The emperor then writes Lin a second letter, telling him to destroy the opium "on the spot" in the presence of other officials, according to the *Repository* version.<sup>48</sup> Kuo writes (*italics added*), "Commissioner Lin was ordered to destroy the confiscated property *on the very spot* where it was surrendered."<sup>49</sup> And again, in footnote 2 of the same page, Kuo has: "Hence the edict ordered Lin and the provincial authorities of Canton to destroy the opium on the spot."<sup>50</sup> These words are missing in the version in King's letter printed in the *Times*.<sup>51</sup> But Chang also cites the phrase from the original in the IWSM.<sup>52</sup> By the time the emperor's second letter reached him on 29 May, Lin must have already moved the opium and completed the tanks because on 3 June, he began to soak the opium in his newly constructed tanks at Chunhow.

On 13 June Lin wrote the emperor of his progress in his transmuting of the opium.<sup>53</sup> This was received in Peking on 8 July (*italics added*):

Upon a previous occasion, I, your minister, and others had the honor of petitioning to send the original chests of opium surrendered by the barbarian vessels to Peking, in regard to which your Imperial Edict of the twelfth day of the fourth month (May 24, 1839) had given full approval. *While we were taking steps towards shipping the said opium*, we received another dispatch from the Privy Council ...<sup>54</sup>

<sup>46</sup> Kuo, p. 237; Waley, p. 45.

<sup>47</sup> Chang, p. 172.

<sup>48</sup> Chang, p. 173.

<sup>49</sup> Kuo, p. 118.

<sup>50</sup> Kuo, p. 118, footnote 2, citing the *C. P. Y. W. S. M.* (T. K.), VI, 20.

<sup>51</sup> King, the *Times*, 1 Nov 1839, p. 2, //infotrac.galegroup.com.

<sup>52</sup> Chang, p. 267, footnote 57; "just at the said place," *ji2 zai4 gai1 chu4*.

<sup>53</sup> Chang, p. 174.

<sup>54</sup> Kuo, p. 244.

But what steps did he take? On 25 May he records in his diary: "At noon the Admiral, Yu pao-shun (a member of Lin's staff) and others came to discuss arrangements for sending the opium to Peking."<sup>55</sup> On 28 May he drafts a proposal to send it by sea which was "apparently never sent to Peking."<sup>56</sup> But other than this conference and proposal, he does not seem to have done anything further in the five days since receiving the emperor's first letter on the subject. By 29 May, when he received the emperor's countermanding edict, he would have probably already completed arrangements at Chunhow to melt it.

The language contained in the emperor's decree to Lin of 29 May 1839 demanded the opium be destroyed "on the spot" where it was received, in the version published in the *Repository*.<sup>57</sup> Kuo also uses "on the very spot" but does not translate this particular edict in his book so he may be quoting from the *Repository*.<sup>58</sup> In either this or King's version, the emperor's decree did not foresee that it would be moved. The very purpose of the decree was so as not to have to transport it further. Not only were there logistical problems pointed out by the censor, but "there was the possibility of irregularities and mishaps during the journey; some of the opium might be stolen or replaced by a cheaper domestic product."<sup>59</sup>

While awaiting further instructions from Peking, Lin has received the opium at Chuenpe, moved it to Chunhow and finished constructing his compound, his storage facilities but also the three large tanks for soaking it in water, lime and salt.

#### 4. THE PROCESSING

Lin's diary and his subsequent letters to the emperor in June make it appear as if the opium had never been moved from where it was initially received. Waley's translation of an entry from Lin's

---

<sup>55</sup> Waley, pp. 45-46; Chang, p. 173.

<sup>56</sup> Waley, p. 46.

<sup>57</sup> Chang, p. 172; CBYWSM (TK), vol. 6, p. 20b, line 6.

<sup>58</sup> Kuo, p. 118.

<sup>59</sup> Chang, p. 173.

diary of 17 June records the visit of the foreigners to watch the process (*italics added*):

This morning at the Hour of the Snake (9 a.m.) the foreigner King, with some ladies in his party, and also Bridgman, Captain Benson and others arrived in a small boat and were then brought in one of our war-junks *to the Bogue*. From a point above the destruction-tank they watched the melting of the opium ....<sup>60</sup>

There are many things wrong (which are examined later) with this version of the story besides the language in which the opium is not being burned nor transmuted, but instead is now being melted. But most important for the discussion of this point of where the site was located, the foreigners were not brought "to the Bogue." They had in fact traveled from where the *Morrison* was anchored a quarter-mile from the forts on the island of Chuenpi *at the Bogue* and then led by Loo some five or six miles out of the main shipping channel and up the small creek to Chunhow. Against this, the Bogue may be a general term including not just the main river channel at Chuenpi but many nearby islands and creeks (in which case the foreigners would have been brought from the Bogue to the Bogue).<sup>61</sup> Kuo, for example, thinks of it this way: "It was stored temporarily at Chenkow, *on* the Bogue."<sup>62</sup> Bridgman uses "near the

---

<sup>60</sup> Waley, p. 50.

<sup>61</sup> Chuenpi was *on* or *at* the Bogue in most reports. Both the English and the Chinese referred to inside, on or at, and outside the Bogue. "Vessels below the Bocca Tigris were called outside, in contradiction to those above, or inside. The high Chinese officials never venture below the Bogue forts in their boats of state" writes Bingham in 1840. Kuo on page 241 translates Lin using the same terms of outside and inside in a memorial to the emperor: "And further, the distance from outside the Bogue to the place of storage inside it was about ten miles." Lin wrote this as the opium was being delivered and before receiving the emperor's instructions to dispose of it on the spot. The translation suggests Lin thinks of Lankit as being outside, not at, the Bogue. The English always refer to the forts at Chuenpi as being located at the Bogue and a previous Kuo translation has Lin arriving at the Bogue (at Chuenpi) to begin receiving the opium. Some authors see Chuenpi just outside the Bogue.

<sup>62</sup> Kuo, p. 116.

Bogue.<sup>63</sup> Lin, as has been seen, thinks of Chunhow (Chenkow, etc.) as being *inside* the Bogue.<sup>64</sup>

Kuo continues, "Commissioner Lin was ordered to destroy the confiscated property on the very spot where it was surrendered .... The Commissioner therefore proceeded to the task of destruction. He ordered two ponds to be constructed near the seashore ...."<sup>65</sup> Further, Kuo translates Lin's memorial of 13 June as: "We conferred with one another again and again and finally resolved that on the seashore two ponds be dug ...."<sup>66</sup> Earlier in the same letter, Kuo translates Lin as saying, "as the Bogue is very near to the seacoast."<sup>67</sup>

This reference to the "seashore" does not fit Bridgman's description of a site just north of Chunhow, "on the bank of a creek, at the brow of a hill."<sup>68</sup> Kuo's reference to "near the seashore" would fit well with a location for the eventual processing of the opium at Chuenpe. But this would have required that the opium would have been transported back from Chunhow, down the river, over the sandbar and again to Chuenpe, where it had initially been delivered. Kuo follows Lin's account of the processing of the opium and ignores that of Bridgman.<sup>69</sup>

Lin says he waits for "the time of the receding tide" to let out the "melted matter" which would have been wise had the tanks been located on the seacoast. There may also have been tidal effects all the way up the creek to Chunhow. Bingham noted problems with the tide during the attack on North Wangtong Island, near Anunghoy and Chuenpi:

---

<sup>63</sup> CR, vol. 8, p. 28 (GB).

<sup>64</sup> Kuo, p. 241.

<sup>65</sup> Kuo, p. 118.

<sup>66</sup> Kuo, p. 246.

<sup>67</sup> Kuo, p. 245.

<sup>68</sup> CR, vol. 8, p. 72 (GB).

<sup>69</sup> Kuo, p. 118.

It had been arranged that an attack simultaneously with that of the artillery, should be commenced by the ships; but a dead calm and adverse tide prevented them from moving until nearly half-past eleven.<sup>70</sup>

The location of Chuenpi (or Lankit for that matter) does fit very well with the "very spot where it was surrendered" as well as the following, written by Lin to the emperor (translated by Kuo): "The barbarians going up to Canton or down to Macao that passed by the spot only gazed at the place from a distance and never tarried long or in any assailing manner. Judged by their manners, it appears that they feel a sense of shame."<sup>71</sup> According to Waley, it reads: "The foreigners passing by in boats on their way up to Canton and down to Macao all get a distant view of the proceedings."<sup>72</sup>

This would of course occur if the opium were to be burned in a giant bonfire on the main shipping channel connecting Canton with Macao and Hong Kong on the coast, in other words either the island of Chuenpi or Lankit. It would *not* fit with a detour five or six miles up the creek to Chunhow, assuming the barbarian deeper draft boats could have crossed the sandbar. Even considering that the site of Chunhow might have been visible from the main channel, a view from five or six miles is "distant" indeed.

There is also the question of just how many foreigners were passing up the channel on their way to Canton. After receiving the last of the opium on 18 May, Lin tried to reopen the trade:

In the month of June, Commissioner Lin concentrated his efforts on directing the British ships to Whampoa (just below Canton) in order to resume the regular trade. On June 9, he issued an edict ordering all ships genuinely interested in trade to proceed to Whampoa: 'If they are not willing to trade, then they ought to return home as speedily as possible, there is no use in their remaining hankering about here.' On the 14th, the prefect of Canton and the subprefect of Macao reiterated Lin's order that lawful traders should enter the port.<sup>73</sup>

---

<sup>70</sup> Bingham, vol. 2, p. 57 (GB).

<sup>71</sup> Kuo, p. 247.

<sup>72</sup> Waley, p. 49.

<sup>73</sup> Chang, p. 195.



But Elliot had already published a notice on 4 May to all British subjects "not to bring any ship to the port of Canton until he had declared it safe for British life, liberty, and property." On 23 May, the day before he "embarked for Macao with all the British subjects recently detained in Canton,"<sup>74</sup> he

solemnly warned that anyone making shipments to the Canton River after this notice would do so entirely at his own personal risk, and that the British government would disregard all future claims of those British subjects who remained in or came to Canton. Arriving in Macao, Elliot was able to report on May 27 that, within the week, all British ships and most British subjects would have left the river.<sup>75</sup>

Dr. Peter Parker reported in the beginning of June that "only about six Englishmen, fifteen or twenty Americans, and no Parsees were left in Canton, and by July 4 all the British had departed."<sup>76</sup>

There is still confusion as to where the opium was eventually soaked in water, lime and salt. Bridgman describes the site as being located at Chunhow, up a river, some five or six miles from where it was delivered. Lin describes a site "on the seashore" that fits well with Chuenpe.<sup>77</sup>

## 5. THE SOURCES

If Waley correctly translates Lin's diary, then Lin has either written some entries long after his memory has faded, or is deliberately misstating the details. The latter would mean, among other things, that he knows his diary can be read by others, either currently or at some future date; he would not be the first public figure to carefully self-censor even his own supposedly private recollections. Waley's translation would fit much better if Lin is making his diary entry for 17 June (after having received the emperor's instructions to destroy the opium "on the spot") jive with

---

<sup>74</sup> Chang, pp. 187-188.

<sup>75</sup> Chang, p. 188.

<sup>76</sup> Chang, p. 195.

<sup>77</sup> Kuo, p. 246.

what he is telling the emperor about the location in his dispatches of 13 June and 5 July.<sup>78</sup> As a result, it would have been necessary to bring the foreigners "to the Bogue" which is where the opium had been received, at Chuenpi. Of course, this may simply be an example of an uncaredful translation.

Is Lin's diary reliable? Just to give some context, this would not be the first time or the last that Lin misrepresents significant details in his diary. Waley writes:

On March 27th there is the entry (in his diary): 'At the Hour of the Snake (9 a.m.) I received through the guild-merchants a note from the English Consul Elliot asking in obedience to my instructions to hand over the opium.' ... The statement that Elliot had 'asked' to hand over the opium may have been a mere slip. Turning to Elliot's note of this date we see that the word 'ask' does occur, but in a different context; he 'asks' for further instructions about the disposal of the opium. The point may seem a small one; but two years later, when Lin was accused of having provoked the Opium War by seizing foreign opium, his rather disingenuous defence was that Elliot had 'asked' to surrender it. His accusers then pointed out that so far from having been voluntarily surrendered, the opium had only been given up, many days after Lin's original demand for it, as the result of a pressure that stopped short of nothing save actual shooting.<sup>79</sup>

But it was far from a slip. It shows up again, in the second letter to Queen Victoria, sent in a draft to the emperor the first days of August 1839 and to England in 1840, where Lin again represents the surrender as being voluntary: "... and through their said country's Superintendent Elliot, by petition, requested that the surrender might be received."<sup>80</sup> Shuck catches this and adds a note: "All Chinese official accounts represent the surrender on the part of foreigners as voluntary and repentant; but it is known to both natives and foreigners that the surrender was forced by threats of starvation and death."<sup>81</sup> Lin is an accomplished poet, skillful with language, and he shows himself meticulous and careful in all of his

<sup>78</sup> Chang, p. 174.

<sup>79</sup> Waley, pp. 38-39.

<sup>80</sup> Shuck, *Portfolio Chinensis*, p. 132 (GB).

<sup>81</sup> Shuck, p. 181 (GB).

decrees to the Chinese and to the foreigners as well as in his preparations for receiving and disposing of the opium.

Can the memorials be trusted? The sense from reading Lin's memorials to the emperor in this period before the war is that he strives wherever possible to make it appear that he fulfills the emperor's decrees to the letter. The emperor wishes the "inhabitants on the coast, and the foreigners in Canton, alike to see and to hear, that they may know and tremble thereat. Respect and obey this mandate."<sup>82</sup> Lin correspondingly reports that they feel "a sense of shame. It is all due to the Virtue of your Holy Majesty which makes both the foreigners and the natives know how to fear and obey."<sup>83</sup>

Later, during the war, Lin sends false reports to the emperor after the battles of Kowloon (4 Sep 1839), Chuenpi (3 Nov 1839) and the Barrier (31 Aug 1840). Waley defends Lin, blaming either the system of reporting or subordinates.<sup>84</sup> The dispatch of Lai En-chao after the battle of Kowloon (4 Sep 1839) contained "hardly a word of truth either as to how the hostilities started or in regard to the action itself."<sup>85</sup> Lin included it in his report to the emperor sent 18 September. Waley calls this a "long established system of false claims, both military and otherwise" that led to "the destruction of any real confidence between the Emperor and his high provincial officers."<sup>86</sup> On the day of the battle of Chuenpi (3 Nov 1839), Lin sent "an optimistic report to the Emperor, claiming to have driven away all the opium-receiving ships and all the foreigners on the black-list."<sup>87</sup> On 21 November he sent a report on the battle to the emperor including a passage about Admiral Kuan. Waley says it read more like a "contemporary heroic ballad or play rather than a piece of sober reporting" (*italics added*):

---

<sup>82</sup> *CR*, vol. 8, p. 36 (MD).

<sup>83</sup> Kuo, p. 247.

<sup>84</sup> Waley, pp. 69-72, p. 84, p. 115.

<sup>85</sup> Waley, pp. 69-70.

<sup>86</sup> Waley, p. 72.

<sup>87</sup> Waley, p. 83.

the admiral stood erect before the mast, drew his sword, and grasping it in his hand directed operations, shouting in a loud and menacing voice that *anyone who attempted to retreat would at once be beheaded*. A fragment of enemy shell brushed the mast and ripped a splinter from it, which grazed the Admiral's arm. The skin was broken and the wound showed red; but the Admiral, heedless of his own safety, still stood sword in hand.<sup>88</sup>

To be fair, even Elliot describes Kuan as "manifesting a resolution of behaviour honourably enhanced by the hopelessness of his efforts."<sup>89</sup> Bingham records a slightly different but still heroic story relayed to the emperor (italics added):

The admiral was sitting in his cabin, when he was wounded by a splinter, in the face; ... The admiral immediately shifted his flag, and *stood by the mast, cheering on his crew* with the most perfect composure to battle, undaunted at the heavy labour; he, indeed, displayed the terror of his name, and again discharged a broadside, which killed several tens of the English barbarians.<sup>90</sup>

Notice that in Waley's translation of Lin's letter to the emperor, the admiral threatens to behead any who retreat while in Bingham's version, he cheers on his crew. Whatever were Kwan's heroics, he caught the attention of the British. Upon recovering his body after a battle early in 1841, "the *Blenheim* fired a salute of minute guns; thus proving to the Chinese that a civilized enemy never scruples to show respect to a valiant foe."<sup>91</sup> The kind of general fictionalization of a messy reality that Lin displays in his dispatches to the emperor occurs quite often in official dispatches, not only by Lin but by the English as well. Elliot for example lies to Lord Palmerston as to the real reason for the battle of Chuenpi.<sup>92</sup> These misleading reports can be passed off as examples of the enduring axiom that truth is always the first casualty of war.

Lin was later accused of disingenuous reporting to the emperor about Elliot's voluntary surrender of the opium (he is never accused

<sup>88</sup> Waley, pp. 84-85.

<sup>89</sup> Waley, p. 85.

<sup>90</sup> Bingham, vol. 1, p. 115 (GB).

<sup>91</sup> Bingham, vol. 2, pp. 66-67 (GB)

<sup>92</sup> Chang, p. 205.

of filing false after-action reports). This accusation was not completely fair. On 12 April, "the day after the opium receiving had begun," Lin wrote to the emperor, as mentioned previously.<sup>93</sup> This was received on 2 May 1839. He informs the emperor in this letter of the procedure he had used to obtain the surrendered opium. He says that it was important to point out to the foreigners "the righteous way and to show them our authority."<sup>94</sup> He demanded the opium and the bond and gave them a "defined period of time to answer. Meantime, soldiers were secretly sent to guard against emergency."<sup>95</sup> He states he blockaded the merchant ships at Whampoa and sent orders that

all trade be suspended, that the working people hired by the foreign factories for the purpose of communication be unemployed, and that the soldiers guarding against emergencies be augmented in number so that all the important passages would be closed to the communication of the barbarian people.<sup>96</sup>

He even labels it a "seclusion" and a "blockade."<sup>97</sup> This fairly describes the situation, covers the major points, and generally describes the level of pressure exerted.

Where was the site located? The barbarians visited a site with three pools at Chunhow. Lin describes a site possibly near Chuenpe with two tanks. The "mysterious discrepancy" of Dr. Chang over the number, size and figure of the tanks appears to be related to the unresolved problem of just where Lin's process took place. From a distance it is only possible to speculate. The argument over location (Chunhow or Chuenpe) continues in Appendix E.

---

<sup>93</sup> Chang, p. 172.

<sup>94</sup> Kuo, p. 239.

<sup>95</sup> Kuo, p. 239.

<sup>96</sup> Kuo, p. 240.

<sup>97</sup> Kuo, p. 240.

## D. WHAT

What actually happened on 17 June 1839 is a matter of serious disagreement even between the two Western eyewitnesses. From how they arrived to what they actually witnessed to when they left, almost every detail of the visit of the foreigners is disputed between the accounts. Lin's account offers further contradictions. It may help to pass step by step through the barbarian inspection tour, making a note of each discrepancy.

## 1. THE ARRIVAL OF THE BARBARIANS

Both King and Bridgman arrived via the *Morrison's* gig. Bridgman never records setting foot on any war-junk though Loo had offered him the honor just that morning.<sup>98</sup> Lin's diary entry, once again, reads differently from his memorial to the emperor on this point. Waley translates Lin's diary of 17 June recording that "Bridgman, Captain Benson and others arrived in a small boat and were then brought in one of our war-junks to the Bogue."<sup>99</sup> In his letter to the emperor he says (*italics added*), "And also the American merchants, King, Bridgman, and others, together with their families, came by *sampan* from Macao ...."<sup>100</sup> Bingham says Lin's use of "*sanpans*, viz., *three planks*" to describe the British corvettes after the battle of Chuenpi is meant to be slightly derogatory, in the same way "barbarians" denoted foreigners.<sup>101</sup> Lin describes in his diary either the *Morrison* or the *Morrison's* gig as a small boat, probably the *Morrison* because he describes it arriving from Macao. On the other hand, this may be trick of the translation. If "brought in" can be made to read "escorted by," then Lin's diary entry for 17 June would fit neatly on this point with the accounts of Bridgman and King.

---

<sup>98</sup> Bridgman, *CR*, vol. 8, p. 71 (GB),

<sup>99</sup> Waley, p. 50.

<sup>100</sup> Kuo, p. 248.

<sup>101</sup> Bingham, p. 115 (GB).

## 2. THE TANKS

Besides the problem of where they were located, the number, shape and size of the tanks is disputed between the foreigners and Lin. In particular, there is a question as to whether there was one tank, two tanks or three tanks, whether it was square or rectangular, and whether it was 150 by 75 feet or 150 to 180 feet on a side.

Waley translates from Lin's diary entry of 17 June recording one tank,<sup>102</sup> Lin reports in his dispatch to the emperor sent 13 June there were two tanks,<sup>103</sup> and both Bridgman and King counted three tanks during their visit on 17 June.<sup>104</sup> In particular, Lin's diary entry for 17 June (as translated by Waley) records that his foreign visitors viewed the operation (*italics added*) "from a point above the destruction-*tank*."<sup>105</sup> Lin, however, writes to the emperor (sent 13 June and received 8 July)<sup>106</sup> that there were two tanks (*italics added*): "We conferred with one another again and again and finally resolved that on the seashore *two ponds* be dug out to be used alternately for the purpose of destroying the said opium."<sup>107</sup> Both Bridgman and King counted three tanks (*italics added*): "On the west side of the enclosure, just within the palisades, were *three large vats or trenches* ....";<sup>108</sup> and, "The larger part of the foreground was covered by *three vats* ...."<sup>109</sup> Of the sinologists, Waley says one, Chung says two, and Chang says three.<sup>110</sup> Of the better popular accounts, both Collis and Fay say three.<sup>111</sup>

Lin tells the emperor the two tanks were square: "Each of the ponds has a flat, stone-paved bottom, more than 150 feet each in

---

<sup>102</sup> Waley, p. 50.

<sup>103</sup> Kuo, p. 246.

<sup>104</sup> Bridgman, *CR*, vol. 8, p. 73 (MD); Warren, pp. 11-12 (GB).

<sup>105</sup> Waley, p. 50.

<sup>106</sup> Chang, p. 174; Kuo, p. 244.

<sup>107</sup> Kuo, p. 246; *liang3 chi2* or two ponds. *Liang3* can also mean "some."

<sup>108</sup> Bridgman, *CR*, vol. 8, p. 73 (MD);

<sup>109</sup> King, in Allen, p. 47 (GB); King, in Allen, p. 11 (GB).

<sup>110</sup> Waley, p. 50; Chung, p. 199; Chang, p. 173.

<sup>111</sup> Collis, p. 231; Fay, p. 160.

length and width ...."<sup>112</sup> Both Bridgman and King saw rectangular tanks: "... say 150 feet long, 75 feet broad, and 7 deep ..."; and, "... of perhaps 75 feet by 150 ...."<sup>113</sup> Waley doesn't describe them or give dimensions, Chung says square "tanks of 150 Chinese feet in both length and width," and Dr. Chang says rectangular "each about one hundred fifty feet long, seventy-five feet wide, and seven feet deep ...." but he adds a footnote: "Lin's report, dated June 13, stated that he built two trenches, each measuring approximately over 150 by 150 *ch'ih*."<sup>114</sup> Neither Kuo nor Chung comment on the discrepancy. Nor do Collis or Fay.<sup>115</sup>

### 3. THE VANTAGE POINT

The foreigners say they didn't inspect the operation from "a point above" the tanks, they inspected them at ground level; they had to, each one was separately fenced.<sup>116</sup> Bridgman and King see the tanks from ground level while Lin says in his diary they inspected the one tank from a point above.<sup>117</sup> If the opium had been destroyed on the spot at Chuenpe, the foreigners could indeed have watched "from a point above" the tanks such as the battery of cannon in the forts above.<sup>118</sup>

### 4. THE SLUICE(S)

King says there were "sluices" on each tank: "each opening by sluices into the river."<sup>119</sup> Bridgman doesn't see sluices, only the one

---

<sup>112</sup> Lin, in Kuo, p. 246; *zong4 heng2*, literally "warp and woof" as weaving.

<sup>113</sup> Bridgman, *CR*, vol. 8, p. 73 (MD); King, in Allen, p. 47 (GB) and Warren, p. 11 (GB). Allen differs from Warren in the placement of a comma. Allen: "...three vats of perhaps 75 feet by 150, each opening...." Warren: "... three vats of perhaps 75 feet by 150 each, opening ...."

<sup>114</sup> Waley, pp. 49-50; Chung, p. 199; Chang, p. 173 and footnote 59, p. 267.

<sup>115</sup> Kuo, pp. 244-250; Chung, pp. 198-201; Collis, pp. 230-231; Fay, pp. 160-161.

<sup>116</sup> Bridgman, *CR*, vol. 8, p. 73 (MD).

<sup>117</sup> Waley, p. 50.

<sup>118</sup> Chang, p. 205; Waley, p. 83; Fay, p. 16.

<sup>119</sup> King, in Allen, pp 47-48 (GB).



sluice on tank three: "The third was about half-filled ... nearly ready to be drawn off. This was to be done through a narrow sluice, opened between the trench and the creek."<sup>120</sup> Kuo's Lin says (*italics added*), "In front of the *pond* [not ponds] there is an exit to the sea; and in the rear an aqueduct."<sup>121</sup> This sentence comes in between two other sentences that begin: "Each of the ponds ... " and "On the banks of the ponds .... "<sup>122</sup> The exact translation of this quotation is curious for this rapid alternation between plural and singular (*italics added*):

Each of the *ponds* has a flat, stone-paved bottom, more than 150 feet each in length and width, with boards on the four walls preventing the outlet of the melted drug. In front of the *pond* there is an exit to the sea; and in the rear an aqueduct. On the banks of the *ponds* there are fences which embrace seats for officers of inspection.<sup>123</sup>

This could be put down to a fault in the translation except for the discrepancy already mentioned between King and Bridgman regarding the number of sluices. Kuo's Lin continues (*italics added*): "At the time of the receding tide, the front *exit* is [not exits are] opened to let out the melted matter .... "<sup>124</sup>

For contrast, Chang does not mention whether there were sluices or only one sluice, does not use the word sluice at all.<sup>125</sup> But Chang does say (*italics added*) "the liquid was made to flow through *screens*."<sup>126</sup> His description of the actual operations on "a trench"<sup>127</sup> occupies one brief paragraph in a book of more than 300 pages. It can only be assumed he means a number of screens, each on a separate tank (not several successive screens on the same tank) which would logically presume a number of exits, each exit to a

---

<sup>120</sup> Bridgman, *CR*, vol. 8, p. 74 (MD).

<sup>121</sup> Lin, in Kuo, p. 246.

<sup>122</sup> Lin, in Kuo, p. 246.

<sup>123</sup> Lin, in Kuo, p. 246.

<sup>124</sup> Lin, in Kuo, p. 246.

<sup>125</sup> Chang, pp. 173-174.

<sup>126</sup> Chang, p. 174.

<sup>127</sup> Chang, p. 174.

tank. Dr. Tan Chung follows Lin's account of two tanks, each with a separate entry for water and exit to the sea: "One side of each of the tanks was connected with a ditch so that water could flow into it. The other side was linked with a creek which could clear the contents of the tank into the sea."<sup>128</sup> Waley does not consider the details of the process. Collis says (*italics added*) "coolies emptied baskets of opium into the *trenches* .... After a time this caused the opium to decompose, when it was drained off by a *sluice* into the creek."<sup>129</sup> Fay has work done on all "three shallow basins" and "at last the watery mess, stinking horribly, was allowed to run into the creek and out to sea with the tide."<sup>130</sup>

This may seem like a trivial point, but it will become important later when considering whether Lin used a one-stage or a two-stage process, whether he had the ability not simply to extract all of the alkaloids in the opium but whether he also could have roughly isolated the morphine as well.

## 5. THE SCREEN(S)

Of the eyewitnesses, neither King nor Lin mentions a screen.<sup>131</sup> Only Bridgman notices that the sluice on tank three was "furnished with a screen, made fine like a sieve."<sup>132</sup> Of the sinologists, neither Waley nor Chung mention a screen.<sup>133</sup> Chang says there were screens (plural) and suggests a purpose for them: "When the drug was completely decomposed, the liquid was made to flow through screens (to prevent the escape of any large lumps of opium) to the nearby creek which carried it to the ocean."<sup>134</sup> Of the better popular accounts, neither Fay nor Collis mentions a screen.<sup>135</sup> Bingham

---

<sup>128</sup> Chung, p. 199.

<sup>129</sup> Collis, p. 231.

<sup>130</sup> Fay, p. 160.

<sup>131</sup> Allen, pp. 47-48 (GB); Warren, pp. 11-12 (GB); Kuo, pp. 244-250.

<sup>132</sup> *CR*, vol. 8, p. 74 (MD).

<sup>133</sup> Waley, pp. 49-50; Chung, pp. 199-200.

<sup>134</sup> Chang, p. 174.

<sup>135</sup> Fay, p. 160; Collis, p. 231.

describes a sieve built of canes as part of the Chinese salt-making process.<sup>136</sup>

The detail of some kind of screen or filter will become important when considering the operation from the standpoint of alkaloid extraction because it retains the precipitate (solids) while allowing the liquid to escape in 21st, 20th and 19th century processing of opium for morphine.

## 6. THE DEPARTURE OF THE BARBARIANS

It has already been noticed that one of the faults in the record is the very brief and somewhat perfunctory inspection by the barbarians of the manner in which the opium was processed. Did they inspect the trenches a second time? After the conference, Bridgman does not say they inspected the trenches any further:

After taking leave of the commissioner, we were conducted back in the same manner as we came up. At five p.m., we were on our way to Macao. About nine o'clock in the evening, our old friend Loo came down to us, to return the papers for translation, they having been presented in English, and the commissioner's linguists being unable to understand them. A translation was promised to be soon ready, and he again took leave. The next day at sunset we reached Macao, well pleased with the trip.<sup>137</sup>

King also does not record a second tour of the trenches. King says they were back on the Morrison at 4:30 p. m. in contrast to Bridgman's 5 p. m. "We regained the ship at 1/2 4 o'clock p. m., and were followed by the usual presents of provisions, and etc."<sup>138</sup> Besides the smell which would have put them off, King was "fully satisfied" and Bridgman could not "conceive how any business could be more faithfully executed."<sup>139</sup> Perhaps they did not feel they needed a second tour. Clearly, the inspection of the tanks and the

---

<sup>136</sup> Bingham, pp. 196-197 (GB).

<sup>137</sup> *CR*, vol. 8, p. 77 (MD).

<sup>138</sup> King, the *Times*, 1 Nov 1839, //infotrac.galegroup.com.

<sup>139</sup> *CR*, vol. 8, p. 74 (MD); Allen, p. 48 (GB)..

processing of the opium was the smallest part of their time there that afternoon.

There is a discrepancy about time in Bridgman's account, and Bridgman is very careful throughout. If it only lasted two hours as Bridgman estimated, the conference would have concluded about 13:30. It was less than an hour back to the *Morrison*. King says they arrived back on board the *Morrison* at 4:30 p. m. which means they would have left Chunkow about 3:30 p. m. In both accounts the conference must have been considerably longer than reported.

At 17:00 they were "on their way" to Macao, according to Bridgman.<sup>140</sup> Loo arrives with the documents, presumably on his own boat, about 21:00, also according to Bridgman. King doesn't say exactly when the documents arrived but when they do the *Morrison* has already weighed anchor:

After weighing anchor my petitions were brought off, with the report that the commissioner's attendants were unable to translate them, and it was further agreed that that office should be done by ourselves on the way to Macao, and the copies again sent up by the *Morrison*.<sup>141</sup>

Unless Loo chased them down the bay, the *Morrison* did not leave Chuenpe until 9 p.m. They arrive back in Macao at sunset on 18 June.<sup>142</sup> Had they left at 9 p.m. on 17 June, this would roughly agree with the slightly less than one days travel up from Macao to Chuenpe. Did they need to wait for the tide to change? Bridgman's watch keeps perfect time on the trip to the site but it deserts him after their brief inspection tour of the opium. It begins to run better after a few hours back on the boat, as if the mechanism had been temporarily affected by the vapors from the decomposing opium.

## E. HOW

How the opium was processed is also a matter of controversy. Each of the three eyewitnesses describes a separate process.

---

<sup>140</sup> Bridgman, *CR*, vol. 8, p. 77 (MD).

<sup>141</sup> King, the *Times*, 1 Nov 1839, p. 2, //infotrac.galegroup.com.

<sup>142</sup> Bridgman, *CR*, vol. 8, p. 77 (MD).

## 1. THE INGREDIENTS

King just notes there was water.<sup>143</sup> Lin writes that "water is first conveyed into the ponds through the aqueduct" according to Kuo.<sup>144</sup> Dr. Tan Chung writes that the tanks were "connected with a ditch so that water could flow into it."<sup>145</sup> Dr. Hsin-pao Chang says there was "two feet of fresh water"<sup>146</sup> in any given trench.

Bridgman sees two feet of fresh water in tank one which is seven feet deep. His workmen are working in tank two so there cannot be too much water in the tank. He writes that tank three, however, was "half-filled (or about three and a half feet), standing like a distiller's vat, not in a state of active fermentation, but of slow decomposition, and was nearly ready to be drawn off."<sup>147</sup>

As for the opium, both King and Bridgman see "balls" of opium.<sup>148</sup> Lin uses "pieces" according to Kuo.<sup>149</sup> By comparison, Chung uses "cakes" and Chang uses "balls."<sup>150</sup>

As noticed earlier, King does not record the use of salt and lime in his narrative. The translations of Lin's decree attached to King's letter published in the *Times* and in the *Canton Repository* both simply record "salt and lime."<sup>151</sup> Slade (1839) translates Lin's decree as "unslaked lime and rock salt."<sup>152</sup> For contrast, Dr. Tan Chung says "lime powder."<sup>153</sup> Shuck (1839) writes simply "lime and salt and water."<sup>154</sup> Kuo uses "salt and hot lime" and "whole pieces of

<sup>143</sup> King, in Allen, p. 48 (GB), in Warren, p. 12 (GB).

<sup>144</sup> Kuo, p. 246.

<sup>145</sup> Chung, p. 199.

<sup>146</sup> Chang, p. 174.

<sup>147</sup> Bridgman, *CR*, vol. 8, pp. 73-74 (MD).

<sup>148</sup> King, in Allen, p. 48 (GB), in Warren, p. 12 (GB); Bridgman, *CR*, vol. 8, p. 73 (MD).

<sup>149</sup> Lin, in Kuo, p. 246.

<sup>150</sup> Chung, p. 199; Chang, p. 173.

<sup>151</sup> King, *Times*, 1 November 1839, p. 2; *CR*, vol. 8, p. 36.

<sup>152</sup> Slade (1839), pp. 109-110 (GB).

<sup>153</sup> Chung, pp. 199-200.

<sup>154</sup> Shuck, p. 181 (GB).

thoroughly heated limes."<sup>155</sup> The original online has "salt brine" (*yan2 lu3*) or "bittern" and lime (*shi2 hui1*).<sup>156</sup>

## 2. THE METHOD

In order to get the opium into the tank, Bridgman records "forms" built over vat two. He sees work proceeding only on this vat, not the others. His vats are 75 feet wide. Few single wooden beams can span this. He does not notice trusses. He does say "forms" supported planks a few feet apart, running the entire 150 foot long trench. He doesn't say of what the forms are built or how they are constructed or whether they rest on the bottom of the tank.<sup>157</sup> King sees "platforms, raised on high benches."<sup>158</sup> Kuo's Lin mentions no forms. For comparison, Chung says the workmen "stood on springboards."<sup>159</sup>

Both King and Bridgman see the opium being "broken down and crushed" on these forms or platforms and then "pushed by the feet of the coolies" according to King, "stamped on the heel till broken in pieces, and then kicked" according to Bridgman.<sup>160</sup> Lin doesn't need forms because his opium pieces are "thrown" into the tank.<sup>161</sup> Lin tells the emperor (according to Kuo) that the opium was "broken into four parts" and he also describes how they were "cutting it into pieces" which were then "thrown" into the tanks.<sup>162</sup> For comparison, Chung says "every opium cake was cut into four pieces and thrown into the tank."<sup>163</sup> Chang uses "broken into pieces and then thrown."<sup>164</sup>

---

<sup>155</sup> Kuo, pp. 118, 246.

<sup>156</sup> CBYWSM (TK), volume 7, page 7b, lines 8 and 9, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024402](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024402).

<sup>157</sup> Bridgman, *CR*, vol. 8, p. 73 (MD).

<sup>158</sup> King, in Allen, p. 48 (GB) who elides the comma, in Warren, p. 12 (GB).

<sup>159</sup> Chung, p. 199.

<sup>160</sup> King, in Allen, p. 48 (GB), in Warren, p. 12 (GB).

<sup>161</sup> Kuo, p. 246.

<sup>162</sup> Kuo, p. 246, 248.

<sup>163</sup> Chung, p. 199.

<sup>164</sup> Chang, pp. 173-174.

There are workers doing all of this. King has, because of narrative context, the workmen stirring tank two from above: "A large number of men were employed in thus mascerating the balls for some days with long rakes."<sup>165</sup> This sentence comes just after he describes how the coolies kick the opium into the pools standing on the "platforms, raised on high benches."<sup>166</sup> Because of context, the detail of the "long rakes" stands out and it makes it seem like the coolies are standing on the platforms, using them to stir the opium from above. Bridgman sees workmen both on the forms above breaking down the opium and workmen *in* the tank below stirring: "At the same time other coolies were employed in the trenches, with hoes and broad spatulas, busily engaged in beating and turning up the opium from the bottom of the tank."<sup>167</sup> There is no mention of forms or planks in Lin's memorials to the emperor, recorded by Kuo. Lin's laborers "stir inside the pond with their plows"<sup>168</sup> in Kuo's translation. For comparison, Chang says: "Laborers with hoes and shovels stirred and turned the mixture."<sup>169</sup> But he doesn't say where they were. Chung says, "Then laborers with iron shovels and wooden rakes stood on springboards over the tank and stirred the mixture."<sup>170</sup> Perhaps Chung noticed the dimensions of the tank and how long the planks would have needed to be in order to have crossed them.

Bridgman sees the workers spreading salt and lime at the same time. King doesn't notice either one, the very heart of the process. Kuo's Lin records a four stage process of "dissolving, mixing, melting, and stirring" meaning water, salt, opium soaking for "half a day" and then lime being spread, and then more settling time waiting for the tide in the first memorial of 13 June on the subject to the emperor; in the second, he says "cutting, dissolving, melting and

---

<sup>165</sup> King, in Allen, p. 48 (GB), in Warren, p. 12 (GB).

<sup>166</sup> King, in Warren, p. 12 (GB); Allen, p. 48 (GB) elides the comma: "platforms raised on high benches."

<sup>167</sup> Bridgman, *CR*, vol. 8, p. 74 (MD).

<sup>168</sup> Kuo, p. 246.

<sup>169</sup> Chang, p. 174.

<sup>170</sup> Chung, p. 199.

destroying."<sup>171</sup> Lin's lime is unslaked, "whole pieces of thoroughly heated limes."<sup>172</sup>

### 3. THE RESULT

What occurred as a result of this peculiar mixing of opium with lime and salt and water is also recorded differently in each account.

#### a. THE SEPARATION

The separation into two parts, one liquid and the other solid, is the very reason for this curious process, when viewed through the lens of a chemical alkaloid extraction. Otherwise, there is no purpose for the screen if there is nothing to retain. What evidence is there for such a separation?

Of the three eyewitnesses, King says only that the "whole became a fetid mud."<sup>173</sup> Bridgman mentions the "slow decomposition" of vat three which had a screen and he suggests a purpose: "It was furnished with a screen, made fine like a sieve, so as to prevent any large masses of the drug from finding their way into the creek."<sup>174</sup> Kuo's Lin tells the emperor (*italics added*): "*At the time of dissolving, the thick oily part floats on the surface, while the siftings sink down.*"<sup>175</sup> Dr. Tan Chung quotes Lin's memorial to the emperor as (*italics added*): "*When it (opium) was being dissolved, a thick layer of oil surfaced, while the residue sank to the bottom.*"<sup>176</sup> Waley does not notice the separation.<sup>177</sup> Chang only says the liquid flowed out while the solids were retained by screens.<sup>178</sup> Neither Fay nor Collis mention the separation.<sup>179</sup> The

<sup>171</sup> Lin, in Kuo, pp. 246, 249.

<sup>172</sup> Lin, in Kuo, p. 246.

<sup>173</sup> King, in Allen, p. 48 (GB).

<sup>174</sup> Bridgman, *CR*, vol. 8, p. 74 (MD).

<sup>175</sup> Kuo, p. 246; originally *nong2 you2 shang4 yong3 zha1 zi3 xia4 chen2* or literally, "oily pus bubbles up on top, dregs sink downwards" line7, p. 8a, v.7.

<sup>176</sup> Chung, p. 200.

<sup>177</sup> Waley, pp. 49-50.

<sup>178</sup> Chang, p. 174.



separation that only Lin describes will show up again in 19th century European experiments with opium and salt brine.

#### b. THE BOILING AND BURNING

The addition of the lime causes a reaction. In Kuo's translation, "It instantly boils, burning by itself."<sup>180</sup> Dr. Tan Chung writes that "lime powder was thrown into the tank. The opium immediately got burnt, and the solution boiled."<sup>181</sup> Unslaked lime could have produced a large amount of heat upon contact with the water.

Bridgman doesn't notice this boiling. His workmen stand *in* the tank while both salt and lime is being "spread profusely over the whole surface" of tank two.<sup>182</sup> Lin's laborers are also inside the tank and they "frequently wear only short trousers, with nothing on the breast and feet,"<sup>183</sup> according to Kuo.

#### c. THE SMELL

King says it stank, using the word "fetid."<sup>184</sup> Bridgman writes that upon arriving in the small gig, he felt "sad and sick at heart" but does not record any bad smell.<sup>185</sup> Kuo's Lin writes to the emperor that a "particularly repugnant smell comes out from it, making people seek to avoid the ponds" and that the barbarians "constantly covered their noses with their hands against the smell."<sup>186</sup> Lin, according to Chung's translation, noted that "a gust of foul smell rose which made one feel unbearable."<sup>187</sup> Chang writes

<sup>179</sup> Fay, pp. 160-161; Collis, pp. 230-231.

<sup>180</sup> Kuo, p. 246.

<sup>181</sup> Chung, p. 199.

<sup>182</sup> Bridgman, *CR*, vol. 8, p. 74 (MD).

<sup>183</sup> Kuo, p. 246.

<sup>184</sup> King, in Allen, p. 48 (GB), in Warren, p. 12 (GB).

<sup>185</sup> *CR*, vol. 8, p. 72 (GB).

<sup>186</sup> Lin, in Kuo, pp. 246, 249.

<sup>187</sup> Chung, p. 200.

that the Americans "frequently nodded their heads and covered their noses to ward off the fetid odor."<sup>188</sup>

#### d. THE QUANTITY

The quantity processed on this day is also disputed. Lin records in his diary for the day of the visit of his American visitors that he "melted 1600 chests."<sup>189</sup> Loo, his captain and tour guide, estimates for Bridgman that afternoon that the number would be "nearly 1300 chests."<sup>190</sup>

#### F. WHY

All three write that the supposed purpose of all of this activity was to destroy the opium. On this they agree.

#### G. DISCUSSION AND QUESTIONS

Having noticed the bare minimum of agreement between these accounts and then the many contradictions, some serious questions can be posed.

#### 1. THE SOURCES

These three eyewitness accounts with their many discrepancies are all that is really known of what Lin did with the confiscated English opium. They are included in their entirety in Appendix C. Were there others? These are the three relied upon by the better scholars who have studied the period. Did Ting and Iliang also write separate dispatches to the emperor describing the process? Did the salt controller? Did a Chinese officer or one of the workmen write a poem or post a placard? Did Charlotte or Captain Benson or some other foreigner mention the process in a letter or diary? Did the

---

<sup>188</sup> Chang, p. 174

<sup>189</sup> Waley, p. 50.

<sup>190</sup> Bridgman, *CR*, vol. 8, p. 74 (MD).

Hoppo or Admiral Kuan? Yet, the better researchers work only from these three. Until such time as other eyewitness accounts surface, these three are the only first person evidence available.

## 2. THE TANKS

Were the tanks connected in some way? Were the tanks built on different levels? Could the contents of one tank be discharged into another? This might explain why Bridgman's water level is higher in tank three than in tank one or tank two.

More importantly, Lin is lying to the emperor about the number, figure and dimensions of the tanks themselves. But why would he lie? Surely, the emperor is not going to care about what are relatively unimportant details of this new process. It also means that the translation is faulty or Lin's diary entry for 17 June is at variance with both what he sends to the emperor on 13 June as well as with the facts on the ground. Of course, both before the war and especially during it, Lin's diary is not always accurate and Lin and other memorialists appear to take every opportunity to embellish reality in their dispatches to the emperor.

Against this background of generally embellished dispatches, it can be argued that Lin is here describing a new process to the emperor and so he logically uses two tanks, used alternately on days A and B, simplifying the details to make the process more understandable, as if he were saying, here's how this works, or think of it in this manner. He should be accurately describing the tanks at Chunhow, of which there were three, rectangular and not square, 150 by 75 English feet and not 150 by 150 Chinese feet. But if one argues this simplification, it can also be argued that Lin has a limited amount of respect for the ability of the emperor to process messy details. It is also possible Lin is describing the vats Shuck says that he constructed at the western pass. Chang is correct to call this discrepancy "mysterious."<sup>191</sup> Appendix E has more of what is rightly labelled speculation on this and the following point of interest.

---

<sup>191</sup> Chang, footnote 59, p. 267.

### 3. THE LOCATION

Could Kuo be confused as to the location of where the opium was finally dissolved? Could the entire area have been known as Chuenpi, and not simply the one island? Does Kuo believe the opium was transported back to Chuenpi, having been stored only "temporarily" at Chenkow? Does Kuo believe Chunhow or Chuenpi is on the seacoast or seashore, not fifty odd miles from it? Kuo quotes from volume 8 of the *Chinese Repository* so he has access to Bridgman's account but he chooses to follow Lin's version, contained in his letters to the emperor. There are many contradictions between the two accounts, but Kuo does not take notice of them.

The language in the emperor's decree would have been fulfilled if the opium were to appear to be destroyed at Chuenpi, because destroying the opium on the point of an island on the main shipping channel (either Lankit or Chuenpi) would allow foreigners passing by "to see and to hear" of the spectacle. This would be true, especially if the opium were to be publicly burned as Lin originally had said it would be, as other opium had been, and perhaps as the emperor assumes it will be. Lin does not tell the emperor of his new process until halfway through, on 13 June, knowing that the emperor will not receive the letter until long after he is finished. Is this why the ponds in Lin's letters to the emperor appear to be located at Chuenpi (or Lankit), the very "spot" of surrender, and not Chunhow, some five or six miles inland?

To summarize the discussion on this admittedly confusing point, both King and Bridgman concur that the ponds, tanks, vats, or trenches were located at Chunhow. Lin makes it appear both in his diary and in his dispatches to the emperor that the tanks are located at Chuenpi (or Lankit), so much so that the translator Kuo believes this and adds a note in square brackets to this effect. Had the opium been destroyed on the same spot where it had mostly been delivered, at Chuenpi, on the Bogue (within sight of the main shipping channel between Canton and the coastal cities of Hong Kong and Macao), this would have fulfilled the letter of the emperor's edict that both foreigners and locals should "see and

hear," especially if it had been destroyed in the giant bonfire King (and perhaps the emperor) had been expecting.

But the tanks were not located at Chuenpi. The opium was moved away from and off the main waterway to Chunhow, a small village behind the island of Anunghoy and up a small creek. Lin's diary entry for 17 June makes it appear as if it had not been moved at all as does an earlier memorial of 13 June to the emperor. There is some evidence that neither Lin's diary nor his memorials to the emperor record or relay every detail exactly as it occurs.

#### 4. THE METHOD

Lin's description of cutting the opium into four pieces and then throwing them into two gigantic square tanks could be seen as just one more small example of the triumph of form over function, making a messy reality conform to a neater, more symmetrical fiction. If the opium was thrown, Lin's hired laborers would have had to throw the opium pieces 75 feet to reach the center of one of his tanks, 37 and a half feet to reach the middle of either Bridgman's tank two or one of King's tanks. Lin must have selected only those laborers with the strongest arms for this task.

Were the forms bamboo like the palisades or timber like the sides? Did the forms rest on the bottom of tank two?

#### 5. THE RESULT

Neither one of the barbarians mentions the separation recorded by Lin: "At the time of dissolving, the thick oily part floats on the surface, while the siftings sink down."<sup>192</sup> King sees only a fetid mud. Bridgman calls it a slow decomposition.

Also, why are Lin's workmen standing barefoot in shorts inside the tank not screaming in pain from the burning limes and the boiling water? For that matter, why are Bridgman's workers not just as unhappy? From the bare description only, the process reads

---

<sup>192</sup> Kuo, p. 246.

less like a destruction of opium and more like a torture of the poor laborers.

Does Bridgman see slaked lime or unslaked lime? Does Bridgman see lime being spread at all or is he describing what someone tells him will happen? The boiling would have attracted attention. Why doesn't Bridgman feel it was worth the attention of his readers this detail of the burning limes? Does Bridgman only see salt being spread? Lin tells the emperor he adds salt, soaks the opium for half a day and only then adds lime. The foreign inspection lasted a mere half hour. Neither of the barbarians may have seen the entire process from start to finish. King saw neither salt nor lime. Bridgman may only have seen salt, not the hot lime.

If he didn't burn the opium with fire, did he burn it with lime? Dr. Tan Chung suggests that the opium *was* "burnt," not by fire, but by the lime (*italics added*): "After that, lime powder was thrown into the tank. The opium immediately got *burnt*, and the solution boiled."<sup>193</sup>

This is a curious and tertiary use of the word "burn." It isn't what Lin means when he writes the emperor in his first memorial on the subject received 10 July 1838 which Kuo translates as "burning it with wutung-oil and throwing it away into the rivers."<sup>194</sup> It does not appear to be what Lin intended to say in the words of his 5 October 1838 memorial to the emperor which Kuo translates as "burned them with fire." It isn't there in the words of the first edict to the foreigners of 18 March 1839 which Morrison translates as "burnt and destroyed" and Shuck translates as "publicly burned" from the traditional character *hui* (blaze, destroy by fire). Nor does it appear in the words of the first letter to the queen circulated in March or April of 1839 which Morrison translates as "committed to the flames, and consumed" and Waley translates as "cast into burning oil," "set fire to" and "burnt." It cannot be read into the memorial Lin sends to emperor just after he receives the first chests where he suggests that it be "moved to Peking to be duly examined and burned" unless one also argues that Lin is proposing to the

---

<sup>193</sup> Chung, p. 199.

<sup>194</sup> Kuo, p. 224.

emperor that he should dig three large tanks in Peking for "burning" the opium with lime. It cannot be found with his choice of the same character, *hui* (blaze, destroy by fire) in Shuck's translation of the second letter to the queen sent off in February 1840. Nor is it what the emperor means when he uses *shao hui* (burn, burn down) to refer to the opium as having been "burned."

Both before and after Lin, opium was burned in China. Some seventy-five years later during another effort at suppression, large quantities of opium were said to have been confiscated and burned publicly in Shanghai in a purpose-built chimney:

Burning opium was no easy matter. Initially coal fires had to be used. The first opium balls dumped down the shoot tended to turn to gel and resist the flames. Once ignited, however, they fueled each other and burned nicely, although periodic raking was required to keep the fire going.<sup>195</sup>

One method for producing quicklime involves burning limestone in a purpose built kiln.<sup>196</sup>

Defenders of Lin, like Chung, enjoy the resort to a metaphorical burning to try to explain the sudden and obvious change from one method to another. Lin's use of *zi4 ran2* to describe what happens when he throws lime into his mix of opium and salt brine may be observation but it is also justification for the obvious change of method. It is not what he or many others originally had in mind.

Each one of the eyewitness reports contradicts and confirms points in the others. Bridgman's account is the most objective and detailed of the three and so carries the most weight. By carefully piecing the three eyewitness accounts together and making some guesses, it is possible to imagine how Lin could have accomplished an alkaloid extraction with this unique and different processing of opium. However, before this should be attempted, it is important to gather evidence so as to be sure that the alkaloids of opium can be extracted using lime and salt.

---

<sup>195</sup> Parssinen, Terry M. and Kathryn Meyer. *Webs of Smoke*. Lanham, MD: Rowman and Littlefield, 1998, pp. 60-61 (GB).

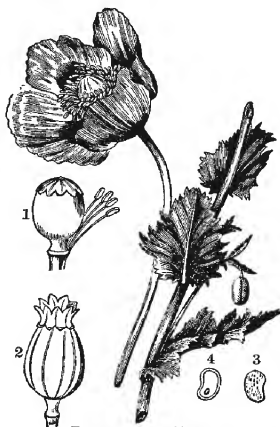
<sup>196</sup> From [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm).

## APPENDICES

### Vol. I

---

The appendices to volume one contain material interesting and germane but not essential for an understanding of what Lin may or may not have done with the confiscated opium in June of 1839.



*Papaver somniferum*:  
1, ovary with few remaining stamens;  
2, ripened capsule; 3, seed; 4, longitudinal section of seed.





## APPENDIX A SILVER, SALT AND OPIUM

---

### APPENDIX A. SILVER, SALT AND OPIUM

- A. SILVER
- B. SALT
- C. THE PROHIBITION OF DOMESTIC OPIUM
- D. SOLUTION OBSERVED AND ABANDONED
- E. DISCUSSION

IT is possible to formulate the following (admittedly simplified) secondary hypothesis: that the war between 1839 and 1842 was *not* due to the importation of foreign opium. Instead, the most significant cause was the exportation of domestic Chinese sycee<sup>1</sup> silver. The Ch'ing dynasty caused the importation of foreign opium with an earlier prohibition of domestic opium, thereby causing the exportation of silver as a consequence.

#### A. SILVER

From a purely economic viewpoint, it would be just as fair to call the coming conflict the Silver War (1839-1842). The Chinese currency, the copper *cash*, had for a thousand years traditionally been legally exchanged for roughly 1000 cash to one tael of silver.<sup>2</sup> However, by the 1830s as silver was being heavily exchanged for foreign opium, the ensuing scarcity of silver led to the severe inflation of the cash.

---

<sup>1</sup> The "native sycee silver (which) came in lumps" (Fay, p. 36). "Silver in lumps, varying from fifty taels to one tael, is called Sycee (from Se-sze, fine floss silk)." It was "never less than 97 parts of pure silver, and not seldom containing one percent of gold." (Gutzlaff, China Opened, p. 18).

<sup>2</sup> Chang, p. 39.

## APPENDIX A

Many of the Chinese memorials to the emperor about opium in the 1830s are simply addressing the problem of the outflow of silver and suggesting solutions (*italics added*):

"The drain of *silver*, to be sure, arouses apprehension." - Yuan Yu-lin, Censor of the Kiangnan Circuit, 12 November 1836;<sup>3</sup>

"I, your minister, most humbly think that the endless drain of the wealth of the nation of course needs check by severe laws and punishments. ... In the purchase of tea or rhubarb by the barbarians ... the commodities (should) be paid purely in *silver*." - Chou Shu, Censor of the Kiangnan Circuit, 17 June 1838;<sup>4</sup>

"These smugglers and dealers, above all others, should indeed be responsible for the drain of our specie .... But now opium is being imported and *silver* exported, while lawless persons pass them back and forth without any dread." - Chingopu, Governor of Shantung, 28 June 1838;<sup>5</sup>

"The officers, high and low, of the river-guard squadron should be made responsible for the faithful patrol and seizure of the sycee *silver* intended for export or opium for import." - Kueiliang, Governor of Honan, 9 August 1838;<sup>6</sup> and,

"In general, the exports exceed the imports. ... Suppose we require them to bring sycee (*silver*) with them to purchase tea." - Teng Ting-chin, Governor-General of Liang-Kwang, 9 October 1838.<sup>7</sup>

Commissioner Lin understood the problem was (*italics added*) "that *silver* bullion is being drained off to foreign countries."<sup>8</sup> In his third memorial to the emperor in 1838, he wrote (*italics added*): "As I, your minister, consider the present scarcity of money, it occurs to me that the circulation of *silver* in the country is much the same as the flowing of a stream. ... The same is true of the situation of *silver*."<sup>9</sup> Indeed, even before he arrived at Canton, both he and Kung Tzu-chen, cofounder of his poetry club, agreed that the first

---

<sup>3</sup> Kuo, pp. 211-212.

<sup>4</sup> Kuo, pp. 215-216.

<sup>5</sup> Kuo, pp. 218-219.

<sup>6</sup> Kuo, pp. 232-233.

<sup>7</sup> Kuo, pp. 235-237.

<sup>8</sup> Kuo, p. 219.

<sup>9</sup> Kuo, pp. 82-83; see appendix C.

## SILVER, SALT AND OPIUM

principle in dealing with the foreigners should be "that China could not afford to let any more silver be drained out."<sup>10</sup>

That the basic problem was not so much opium as the outflow of silver from China was also well-understood at the time by the foreigners. Bridgman published in the *Chinese Repository* in September 1838 a memorial to the emperor from Hwang Tseotsze (Huang Chueh-tzu)<sup>11</sup> describing the underlying problem succinctly:

Hwang Tseotsze, president of the Sacrificial Court, kneeling addresses the throne .... It seems to your minister, that the present enhanced value of silver, of a tael of which the cost has recently exceeded 1600 cash, arises not from the waste of silver bullion within the country, but from its outflow into foreign regions.<sup>12</sup>

It was a problem that had been for a long time increasing:

(B)etween the third and eleventh years of Taoukwang (1823-1831), the country was drained to the annual amount of from seventeen to eighteen millions of taels; between the eleventh and fourteenth years, it was drained to the annual amount of twenty millions; and between the fourteenth and this time, to the yearly amount of thirty millions and upwards.<sup>13</sup>

But the heart of the problem was this:

The land and capitation taxes, and the contributions for supply of grain, are paid, for the most part, in all the provinces and districts, in copper cash. When the sums collected are accounted for to government, these copper cash have to be exchanged for silver. The loss now experienced upon this exchange is so very heavy, that, in consequence of it, the officers have everywhere to supply deficiencies in the revenue, whereas formerly there was in general an overplus.<sup>14</sup>

---

<sup>10</sup> Chang, p. 126.

<sup>11</sup> Chang, p. 40.

<sup>12</sup> *CR*, vol. 7, pp. 271-272 (MD).

<sup>13</sup> *CR*, vol. 7, p. 273 (MD).

<sup>14</sup> *CR*, vol. 7, p. 273 (MD).

## APPENDIX A

Superintendent Elliot noticed the "continued drain of silver."<sup>15</sup> Articles in the foreign press noticed it. "We have shown its real origin in the baser motives of the prevention of the export of sycee silver:"<sup>16</sup>

We cultivate a sincere respect for those honourable and truly benevolent persons who have been *duped* by such incidental professions, as have been fairly and impartially collated, of excessive paternal regard for the morals and the health of the people on the part of the Chinese government. The fact is, that this apparently thrilling philanthropy is a *pure affair of money*, just as much as the levy of revenue in this country on the consumption of gin; only in another form. ... (The emperor) dispatched Lin to stop the '*oozing out of sycee silver*;' which, and not the devastating influence of opium upon his people, as Lin would have us believe, made the great Emperor 'actually quiver with indignation.'<sup>17</sup>

First Lt. Bingham aboard the *Modeste* in 1840 explained it this way: "But neither the morals, nor the health of the subject, has been the real cause; which may more properly be found in the oozing out of sycee silver from the central flowery land."<sup>18</sup>

The adventurer-military governor Karl Gutzlaff says the emperor was forced to pay his soldiers in silver dollars because of the inflation of the copper cash: "It was in imitation of the (Spanish) dollar, that the reigning monarch, not long ago, issued pieces of money nearly equal in weight, but of fine silver, with which the soldiers are paid."<sup>19</sup>

Put simply, the people bought and sold in cash; taxes were paid in silver. Cash had to be exchanged for silver. Less silver meant more cash for every weight of silver. Bad money drives out good.<sup>20</sup>

---

<sup>15</sup> Kuo, p. 100.

<sup>16</sup> "War with China and the Opium Question," *Blackwood's Edinburgh Magazine*, vol. xlvii. Edinburgh: Wm. Blackwood and Sons, 1840, p. 384 (GB).

<sup>17</sup> *Blackwood's*, p. 386 (GB), italics original.

<sup>18</sup> Bingham, p. 2 (GB).

<sup>19</sup> Gutzlaff, K. F. *China Opened*. Vol. 2. London: Smith, Elder and Company, 1838, p. 19 (GB).

<sup>20</sup> Gresham's Law, attributed to Sir Thomas Gresham (1518/1519-21 Nov 1579), merchant, financier, and founder of the Royal Exchange. Briefly, "if

## SILVER, SALT AND OPIUM

### B. SALT

The outflow of silver and the consequent inflation of the cash show up in the problems experienced by the salt merchants. Salt was a government monopoly in Ch'ing (Manchu) dynasty China and one of Lin's first jobs was "acting salt controller in Chekiang" province in 1822.<sup>21</sup>

In September 1831 on his first voyage while aboard the Chinese junk *Shunle* on the Pei-ho river, Karl Frederich Gutzlaff noticed salt being withheld from the market:

the large and numerous stacks of salt along the river, especially at Teen-tsin, (which) cannot fail to arrest the attention of strangers. The quantity is very great, and seems sufficient to supply the whole empire; it has been accumulating during the reign of five emperors; and it still continues to accumulate. This salt is formed in vats near the sea shore; from thence it is transported to the neighborhood of Ta-koo, where it is compactly piled up on hillocks of mud, and covered with bamboo mattings; in this situation it remains for some time, when it is finally put into bags and carried to Teen-tsin, and kept for a great number of years, before it can be sold. More than eight hundred boats are constantly employed in transporting this article; and thousands of persons gain a livelihood by it, some of whom become very rich: the principal salt merchants, it is said, are the richest persons in the empire.<sup>22</sup>

On his second voyage, aboard the British East India Company *Lord Amherst*, Gutzlaff again inspected Chinese salt works and noticed the political changes:

The next day (10 March 1832), which was very fair, we made an excursion to the right of Keat-sze. Here are extensive saline works, consisting of an elevated bed of mud, where the sea water is partially evaporated. After this it

---

coins containing metal of the different value have the same value as legal tender, the coins composed of the cheaper metal will be used for payment, while those made of more expensive metal will be hoarded or exported and thus tend to disappear from circulation." From [www.britannica.com](http://www.britannica.com).

<sup>21</sup> Chang, p. 122; *The New Encyclopedia Britannica*. 15th ed. Vol. 16.

Chicago, IL: E.B. Inc., 1998, p. 367.

<sup>22</sup> Gutzlaff (1834), pp. 119-120 (GB).

## APPENDIX A

is boiled till the pure salt appears. The monopoly of salt is one of the most important revenues of the Celestial Empire. The merchants who deal in it are generally the richest individuals in the country. Yet the monopoly, though under the conduct of certain officers, is generally so conducted as to become very oppressive to the poor, and a heavy national burden.<sup>23</sup>

The merchants in the salt monopoly were personally confronted with the problem described in his 1838 memorial to the emperor from Hwang Tseotsze (Huang Chueh-tzu):

The salt merchants of the several provinces always sell the salt for copper coin, while they are invariably required to pay the gabel (levy)<sup>24</sup> in silver; and, hence, the business of a salt merchant, a business formerly contended for as affording certain profit, is, under existing circumstances, looked upon as a pursuit surrounded with risk. If this state of things continues a few years longer, the price of silver will become so enhanced, that it will be a question how the revenues collected can possibly be accounted for, or the gabel paid up. And should any anticipated cause of expenditure arise, it will become a question, how it can possibly be met.<sup>25</sup>

In this three year period 1831-1833 (the period when Gutzlaff was visiting the salt works) as much silver was leaving the country as had come in during the entire decade of 1811-1820.<sup>26</sup> It would have been nothing but simple self-interest on the part of the salt merchants to withhold the salt from the market in the hope of getting a better price in copper so as to be able to more easily pay the tax to Peking, which had to be paid in silver. The perceived mismanagement seen from Gutzlaff's standpoint would have been due not so much to the mandarins in charge of the salt monopoly but, at least in part, to the outflow of silver for foreign opium, itself due to the Chinese prohibition of domestic opium with the all too predictable consequent smuggling, both of salt and opium.

---

<sup>23</sup> Gutzlaff (1834), pp. 159-160 (GB).

<sup>24</sup> Chang, p. 40; the levy, or taxes remitted to the central government.

<sup>25</sup> *CR*, vol. 7, p. 273 (MD).

<sup>26</sup> Chang, p. 41, who cites the *P'eng Hsin-wei*, vol. II, pp. 564-565.

## SILVER, SALT AND OPIUM

### C. PROHIBITION OF DOMESTIC OPIUM

Particularly striking is the drain of silver from the country for imported opium during campaigns to suppress domestic poppy cultivation and domestic production of opium. Until 1820, silver had been flowing in, not out. Observed above, between 1821 and 1830 this began to reverse and in the three year period 1831-1833 as much silver left the country as had come in during the entire decade of 1811-1820.<sup>27</sup> This increase in the export of silver for the period 1831-1833 corresponds closely with the first very seriously enforced prohibitions on domestic poppy cultivation and domestic production of opium.

Many authors who have studied the period have wondered why the problem is always stated as having been *foreign* opium. Arthur Waley, for example, questions why Lin, in his edicts, tends to ignore Chinese opium:

A second question that arises is, why does Lin almost always take the term 'opium' as being synonymous with 'foreign opium' and to a large extent ignore the fact that a great deal of opium was made from poppy-fields in China?<sup>28</sup>

#### The Reverend Thelwall notices

that no laws had availed to prevent either the cultivation of the poppy plant, or the preparation of opium, in China itself. ... (In Yunnan) the poppy is cultivated all over the hills and open champaign, and that the quantity of opium annually produced there cannot be less than several thousand chests.<sup>29</sup>

Lord Palmerston stated the thesis as: "The mandarins allowed opium to be cultivated right inside China itself and objected to its importation only because it cost them silver."<sup>30</sup> But domestic opium was not allowed, at least officially.

---

<sup>27</sup> Chang, p. 41, who cites the *P'eng Hsin-wei*, vol. II, pp. 564-565.

<sup>28</sup> Waley, p. 26.

<sup>29</sup> Thelwall, p. 545 (GB).

<sup>30</sup> Fay, p. 204, quoting Hansard's Parliamentary Debates, Third Session, 53: 818.



## APPENDIX A

In fact, before they attempted suppression of foreign opium, the Chinese authorities had already been suppressing both domestic poppies and domestic production of opium:

Round about 1830 there were extensive poppy-fields even in so accessible and thickly populated a province as Chekiang, on the south-east coast; but in 1831 there was a great drive to suppress poppy growing, and it seems ultimately to have been confined chiefly to remote districts in the outer provinces.<sup>31</sup>

Dikötter also notices the increasingly severe laws against opium:

Moreover, in 1820 the Qing government declared tough new anti-opium legislation which forced the foreign Canton trade to Lingding (Lintin) Island, some 125 kilometres south of the city, at a great distance from any supervision that Qing officials could effectively have imposed. The new found isolation suited the country traders, who turned the island into a harbour for a new breed of fast, armed opium clippers. The new harbour thus formed an ideal starting-point for the contraband traffic which culminated in the 1830s.<sup>32</sup>

H. B. Morse recorded an important imperial decree in 1831 on growing poppies (*italics added*):

Later in the same month the Peking Gazette of August 25th contained an imperial decree prohibiting the cultivation of the poppy and the production of opium in China. ... This was the *first record of an express prohibition of the production of opium in China*.<sup>33</sup>

It may have been the first record of a prohibition on the production of opium but Chang lists an "imperial edict (that) prohibited the domestic cultivation of the poppy" from 1800.<sup>34</sup>

But one thing is law and another is enforcement. In March of 1831, the emperor issued another edict which required local authorities to "file bonds with the governor-general at the end of

---

<sup>31</sup> Waley, p. 26.

<sup>32</sup> Dikötter, et al., p. 41.

<sup>33</sup> Morse, H. B. Chronicles of the East India Company Trading to China. Vol.

4. Cambridge, MA: Harvard University Press, 1926, pp. 227-228.

<sup>34</sup> Chang, p. 219.

## SILVER, SALT AND OPIUM

each year guaranteeing that there was no cultivation of the poppy ... in their area."<sup>35</sup> And in August of 1831,

the emperor issued an edict directing all governors-general and governors to have all their subordinates down to the *pao-chia* level search for areas of poppy culture. It was decreed that all lands so used were to be confiscated and the offenders punished as if they had been selling opium.<sup>36</sup>

Could this domestic suppression campaign against domestic cultivation of poppies and domestic production of opium have anything to do with the increase in the same period in demand for foreign opium? And with the recorded sudden increase in the same time period for the outflow of silver?

Chang lists five reasons for the "tremendous increase in the (foreign) opium trade" in the 1830s:

(1) the end of the East India Company's monopoly and (2) the rapid influx of British traders, (3) the policy of expanding opium production in India, (4) the new clipper ships which made speedier transportation possible, and (5) the rapid expansion of the traffic farther and farther east and north along the China coast.<sup>37</sup>

All of which are true. However, reasons two through five are, obviously, responses to reason one, the break-up of the East India Company's monopoly on the China trade, itself a product of a long free-trade campaign.<sup>38</sup> Further, they can also be seen as responses to an increase in demand for the foreign product, not the causes of that demand.

As well, reason one, the break-up of the monopoly, did not occur officially until April 1834. This would not explain the phenomenon of the sudden outflow of silver for the years 1831-1833. An increase

---

<sup>35</sup> Chang, p. 220.

<sup>36</sup> Chang, p. 220: "(T)he famous *pao-chia* (security group) system" was, says Waley on page 23, the collection of each Chinese into a group of five, "the head of the group guaranteeing the good behaviour of the rest and being held responsible for any member's misdeeds."

<sup>37</sup> Chang, p. 22.

<sup>38</sup> Chang, pp. 51, 246.

## APPENDIX A

in demand for the foreign product would explain this. And this increase in demand for foreign opium fits quite neatly with the sudden scarcity of domestic poppy plantations and consequently domestic opium due to the strong enforcement of the emperor's new edicts against both.

Those who wish to argue that the increased demand was caused by the opium itself will have to find examples of the same sudden increase in demand in the opium-soaked Britain of the same time period. Those who wish to argue the increased demand was caused by the particular method of ingestion of the opium, i.e. smoking, will need to explain why there was no such increase for many decades and even many hundreds of years of opium use and opium smoking in China. Those who wish to argue that more effective Chinese enforcement of the prohibition of foreign opium was possible should first find an historical example in any other country of a successful prohibition of any other drug.

### D. SOLUTION OBSERVED AND ABANDONED

Modern scholars of the period have all confronted the problem of the outflow of silver: "But the real source of consternation was the question of the exportation of sycee silver;"<sup>39</sup> "... the outflow of Chinese silver, which was regarded by Lin and all the foremost statesmen of the time as disastrous to China's finances;"<sup>40</sup> "the populace, who used copper day by day, were obliged to convert it into silver very extensively when making tax payments. If silver became more valuable in terms of copper, they would suffer;"<sup>41</sup> "The outflow of silver precipitated a severe economic crisis;"<sup>42</sup> and, " ... the increase of the silver price. Ultimately, the burden of inflation was shifted onto the consumers."<sup>43</sup>

---

<sup>39</sup> Kuo, p. 50.

<sup>40</sup> Waley, p. 25.

<sup>41</sup> Fairbank, John K. Trade and Diplomacy on the China Coast: The Opening of the Treaty Ports, 1842-1854. Vol. I. Cambridge, MA: Harvard University Press, 1953, p. 75 found in Chang, p. 243.

<sup>42</sup> Chang, p. 39.

<sup>43</sup> Chung, p. 176.

## SILVER, SALT AND OPIUM

Just as modern scholars have noticed the problem of silver and then ignored it to focus on the demon opium, the Chinese memorialists of the period all recognized the problem of the outflow of silver to be of primary importance, but almost all concluded that stricter enforcement, harsher laws and new prohibitions on the importation of opium was the answer.

Only one memorial, that of Hsu Nai-chi, subdirector of the Court of Sacrificial Worship, specifically recommended on 17 May 1836 the re-legalization of opium: "A tariff duty would be imposed on the article, which was to be [re]classified as medicine."<sup>44</sup> He was supported by a "small group of scholars teaching at the *Hsueh-ha t'an*, an academy founded by Juan Yuan in 1820."<sup>45</sup> Other faculty members wrote articles in support of Hsu's memorial. Newly appointed Governor-General Teng Ting-chen "outlined a nine-item regulation which would put Hsu's policy into practice"<sup>46</sup> in Canton. The British opium smuggler Jardine in a letter dated 26 July 1836 to John Rees, one of his ship captains, was unhappy with the idea: "I do not think well of the plan as far as our interests are concerned - though it has already enhanced prices."<sup>47</sup> The *Canton Register*, however, reputedly Jardine's mouthpiece, called it a "glimmer that is breaking through the chaotic darkness of Chinese legislation."<sup>48</sup> This glimmer was quickly extinguished and two years later, Hsu was demoted and dismissed by the emperor who had decided upon a determined policy of strict prohibition.

## E. DISCUSSION

The tentative secondary hypothesis presented in this appendix is that the decision to attempt to enforce a prohibition of domestic opium had as a direct consequence the increased demand for foreign opium causing a subsequent increase in the outflow of silver. This

---

<sup>44</sup> Chang, pp. 85-86.

<sup>45</sup> Chang, p. 85.

<sup>46</sup> Chang, p. 88.

<sup>47</sup> Chang, p. 87.

<sup>48</sup> Chang, p. 87.

## APPENDIX A

hypothesis is most clearly stated by Bridgman in the *Chinese Repository*:

There is yet another proposal - to remove the prohibitions against the planting of the poppy, and to suffer the preparation of opium within the country, by which it is hoped to stay the increasingly ruinous effects of foreign importation, to stop the efflux of silver.<sup>49</sup>

Disputing this hypothesis is the lack of good data. The data for both imports of opium and exports of silver vary from fiscal year to fiscal year and author to author, some using one source and others another. As a result, though this outflow of silver was noteworthy enough to be included in memorials to the emperor, the precise data for any given period may be an artifact of the method used to compute it. To confirm or deny this hypothesis would require comparing good data for the total sales of opium in both India and Turkey, the total imports of opium both private and in BEIC company ships, the total production of domestic Chinese opium, and the total Chinese exports of silver against the timing and nature of the decrees as well as good sociological data and ground-level observations as to the relative nature and level of enforcement of the decrees. This data would then need to be adjusted for the Chinese expenditure of silver on other commodities, the total Chinese production of silver, the worldwide production of silver, and the Chinese and worldwide economic recessions and inflations during this period: "Even without any opium imports at all, China would have been adversely affected by a global recession after 1820."<sup>50</sup> While this secondary hypothesis is logical, the data needed to confirm or deny it would be admittedly difficult to obtain.<sup>51</sup>

---

<sup>49</sup> *CR*, vol. 7, p. 275 (MD).

<sup>50</sup> Dikötter, et al., p. 44.

<sup>51</sup> "Effective enforcement of the regulations seldom lasted for any length of time" (Chang, p. 18); "The estimates of the total number of smokers in China were thus at great variance. ... (T)here is no reliable record of the total amount of opium supplied, for the Canton imports were supplemented by the domestic product and by supplies smuggled in elsewhere along the coast" (Chang, p. 35); the Chinese population was estimated at between 350 and 400

## SILVER, SALT AND OPIUM

Also disputing this hypothesis is good information that imported opium "could not account for more than half of the outflow of silver."<sup>52</sup> The Ch'ing government "had seldom been able to maintain a suitable exchange ratio between silver and copper even under better circumstances."<sup>53</sup> Dr. Chang is careful to mention a number of other factors affecting the outflow of silver including a general decline in the world production of silver, expensive military campaigns to suppress rebellions in Yunnan, Kweichow, Hupeh, Szechwan, and Shensi as well as insurrections by Moslems and minority races in the southwest, widespread official corruption, and a constantly expanding supply of (poorly minted and debased) copper coins.<sup>54</sup> Dikötter, Laamann and Xun believe these other reasons for the outflow of silver were understood at the time, at least by some: "recent scholarship has indicated that in the decade preceding the 'Opium War' (Chinese) official opinion was divided about the amount of silver outflow that could be attributed to payments for opium."<sup>55</sup> Confirming this viewpoint, Kuo translates, for example:

In my humble opinion, the drain of our wealth cannot be completely attributed to the barbarians. ... Nor is the export of silver to be attributed completely to opium. ... If they (make) it impossible for foreign goods to be smuggled in and for our silver to be smuggled out, the government finance will daily become richer. - Paohsing, General of Mukden, 28 June 1838.<sup>56</sup>

Essentially, this secondary hypothesis posits that the cause of the war of 1839-1842 was the Chinese prohibition of domestic opium making necessary the importation of foreign opium thus causing the

---

million (Chang, pp. 34-35); "Although Turkish opium was quite negligible on the China market before 1828 ... (in 1839 the American firm Russell and Company) surrendered to the Chinese (opium that) was surpassed by only two firms, Dent and Jardine, Matheson" (Chang, p. 31).

<sup>52</sup> Dikötter, et al., p. 43, quoting Dermigny, *Le Commerce à Canton*, vol. 3, pp. 1341-3.

<sup>53</sup> Chang, p. 46.

<sup>54</sup> See Chang's excellent discussion of the ramifications of the problem, pp. 36-46.

<sup>55</sup> Dikötter, et al., p. 44.

<sup>56</sup> Kuo, pp. 216-217.

## APPENDIX A

outflow of silver. For this hypothesis to be true, however, imported opium need not account for all of the outflow in silver, only increased outflows of silver during initial periods of harsh domestic suppression campaigns.

What seems to be clear is that before the 1830s, opium had not been treated as so much of a problem; once the silver began leaving in large quantities, opium becomes *the* problem, especially foreign opium. It also seems clear that, from an overall perspective, the foreign opium was only being imported (and the domestic silver exported) because of the prohibitionary edicts themselves. In short, "merchants in China traded silver during the first half of the 19th century because they could make a profit and bought a commodity they lacked (opium) in response to local demand."<sup>57</sup>

It can only be speculated that had the emperor simply (re)legalized domestic opium as a medicine, this would have eventually halted the importation of foreign opium and with it the exportation of domestic sycee silver. Indeed, in the latter part of the 19th century this appears to be exactly what took place, and with this renewed legalization the "opium crisis" simply evaporated.<sup>58</sup>

If this secondary hypothesis is true, the prohibition on foreign opium as a solution to the predictable and consequential outflow of silver due to the domestic suppression of opium can only be described as a great historical blunder, both futile and counter-productive, achieving exactly the opposite of what was desired, which was to halt the drain of silver in the first place.

---

<sup>57</sup> Dikötter, et al., p. 44.

<sup>58</sup> Feige, Chris and Miron, Jeffrey A. "The Opium Wars, Opium Legalization, and Opium Corruption in China," April 2005, pp. 2-6, found at <http://scholar.google.com>.

APPENDIX B  
THE PLANT, *PAPAVER SOMNIFERUM* L.

---

- APPENDIX B. THE PLANT, *PAPAVER SOMNIFERUM* L.
- A. HISTORY
    - 1. LANGUAGES
    - 2. ARCHAEOLOGY
    - 3. LITERATURE
  - B. DESCRIPTION
  - C. GEOGRAPHY
    - 1. 20TH/21ST CENTURY  
COMMERCIAL PRODUCTION
    - 2. 19TH CENTURY  
COMMERCIAL PRODUCTION
  - D. CULTIVATION
    - 1. CLIMATE AND SOIL
    - 2. FIELD SELECTION AND LAND CLEARING
    - 3. LAND PREPARATION AND  
CULTIVATION METHODS
  - E. SIMPLE PLANT EXTRACTIONS
  - F. THE JUICE OF *P. SOMNIFERUM*, OPIUM
    - 1. DESCRIPTION AND HISTORY
      - a. LANGUAGE
      - b. ARCHAEOLOGY
      - c. LITERATURE
        - i. IN THE WEST
        - ii. IN CHINA
    - 2. HARVESTING
    - 3. PROCESSING OPIUM FOR  
THE CHINA MARKET
      - a. DRYING
      - b. PACKING



## APPENDIX B

- G. THE POPPY STRAW METHOD
  - 1. DESCRIPTION AND HISTORY
  - 2. HARVESTING
  - 3. PROCESSING
  - 4. ALKALOID EXTRACTION
- H. DISCUSSION

ONE must begin with the plant, *Papaver somniferum* (Linnaeus, 1753), a poppy. The plant is different from what humans choose to do with it. Humans use the plant in many different ways. Extracting a sap is only one of them.

A brief history and botany are presented here simply to familiarize and demystify the plant. Many in the West today have very little experience with poppies, this particular poppy or opiates in general, much less than they have with the grapevine, the variety cabernet sauvignon, or the alcohols in general. Few would confuse whites and reds, grapes and wine, beer and pure grain alcohol or vodka and rubbing alcohol. Those unfamiliar with *Cannabis sativa* L., however, often use the words "drug," "cannabis" and "marijuana" incorrectly to refer to more than one of the following: the plant, the flowers, the dried and cured smokeable flowers, or even THC and other chemically extractable substances or their synthetic homologues. *Cannabis sativa* L. is the plant, the dried and cured flowers are sometimes called "marijuana," and tetrahydrocannabinol is just one of many substances extractable from plant resins.

For the same reasons, it is important to carefully distinguish whether we want to talk about the plant *Papaver somniferum* L., certain parts of the plant (seeds, leaves or capsules), processed parts of the plant (dried capsules), simple plant extracts (teas, tinturas or the collected sap), the purified alkaloids (morphine, codeine, papavereine, etc), or the semi-synthetic, synthetic and homologous versions of the alkaloids (heroin, methadone, etc). This particular

## THE PLANT, *PAPAVER SOMNIFERUM* L.

poppy is often called the "opium" poppy<sup>1</sup> but this is more pejorative than descriptive; it argues beforehand not just a use but a particular use while in fact the plant is used for many other purposes as well. It also attaches not simply an adjective but a stigma, an attraction and a repulsion, an exoticism, an unnecessary and not very useful connotation. For that matter, it is also called the "oil poppy."<sup>2</sup> The DEA calls poppy plantations "opium farms."<sup>3</sup> Perhaps there is some metaphorical truth in this, but an outside observer who called every plantation of grapes a "wine farm" would ignore major industries in oil, raisins, table grapes and cider. In order to carefully avoid the sense that what is under discussion is something relatively strange, it is useful to first become familiar with the plant.

### A. HISTORY

We can trace the history and extent of the plant through words, stones and bones, and stories.

#### 1. LANGUAGES

Words have histories of their own. The same plant is known today by many names in many languages. Its Linnean designation is *Papaver somniferum* L. (Family, *Papaveraceae*). The unknown author of the DEA pamphlet 20026 has his etymology, in part, incorrect: "The genus, *Papaver*, is the Greek word for poppy."<sup>4</sup> In

---

<sup>1</sup> "Opium Poppy Cultivation and Heroin Processing in Southeast Asia," a pamphlet issued by the U.S. Department of Justice, Drug Enforcement Administration in March 2001, listed as DEA-20026, p. 1 and found at [www.shaps.hawaii.edu/drugs/dea20026/dea20026.html](http://www.shaps.hawaii.edu/drugs/dea20026/dea20026.html) (hereafter simply, DEA 20026).

<sup>2</sup> Laughlin, J.C. and D.I. Morris. Identification of Prohibited and Non-prohibited Species of Poppy Growing in Tasmania. A booklet issued to its field officers by the Poppy Advisory and Control Board, Tasmania, Australia, p. 5; "A History of Poppy Production," in *Leaders in Poppy Production*, a promotional brochure published by GlaxoWellcome, Australia, Ltd., p. 3.

<sup>3</sup> DEA 20026, p. 5.

<sup>4</sup> DEA 20026, pp. 1-2.

## APPENDIX B

fact, the Latin word for poppy is *Papaver*, sometimes used simply to mean kernel or seed.<sup>5</sup> The same author continues: "The species, *somniferum*, is Latin for sleep-inducing."<sup>6</sup> Generally accepted is the derivation from *somnium* for sleep, and *ferum*, from *facere*, to make or to cause.<sup>7</sup> But *somnium* is also dream, fancy, foolish nonsense or daydream and *ferus* is fierce, wild, savage or untamed.<sup>8</sup> This suggests a secondary translation of *Papaver somniferum* as the seed (or capsule) of untamed dreams slightly distinct from the references only to sleep.

The plant also has common names all over the world. In Castellano it is *Dormidera*, in Catalan, *Cascall*, in Gallego, *Dormideira*. The Basques call it *Lobelarr*, the French, *Pavot somnifere*. The English simply refer to it as the garden poppy. In German it is known as *Carten Mohn* and in Italy, *Papavero*.<sup>9</sup>

Writing in 1840, in his *Portfolio Chinensis*, Shuck added that "the Welsh call it *pabi*. The French name it *parot*. It is the *mak* of Hungary and Bohemia, the *maczek* of Poland, and the *garten-mohn* of the Germans. It is called *post* by the Hindoos, *albin atta* by the Cingalese, and by the Japanese *kcsi*. The Chinese designate it *ying-suh*."<sup>10</sup> Chang and Chung say that the plant is also "called *ying-su* (the jar with millet), *mi-nang* (rice bag) or transliterated as *po-pi* (poppy, in English) and *a-fu-jung* (from the Semitic *afyun*, using *fu-jung* - lotus, in Chinese - as a suffix)."<sup>11</sup> Introduced into Chile by the Spanish, the native Mapuches called it *Madi-huada*, from *madi*,

---

<sup>5</sup> From [www.perseus.tufts.edu](http://www.perseus.tufts.edu).

<sup>6</sup> DEA 20026, p. 2.

<sup>7</sup> Which can be confirmed at many sources including [www.freedictionary.com](http://www.freedictionary.com), <http://arts.cuhk.edu.hk/lexis/latin> and [www.linnaeus.uu.se](http://www.linnaeus.uu.se).

<sup>8</sup> From [www.perseus.tufts.edu](http://www.perseus.tufts.edu), [www.linnaeus.uu.se](http://www.linnaeus.uu.se) and <http://arts.cuhk.edu.hk>.

<sup>9</sup> Muñoz, Fernando. *Plantas Medicinales y Aromaticas*. Madrid: Ediciones Mundi-Prensa, 2002, p. 67.

<sup>10</sup> Shuck, J. L. *Portfolio Chinensis*. Macao, China: Shuck, 1840, p. ix (GB).

<sup>11</sup> Chang, p. 16; Chung, p. 147.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

"honey-like, sweet, syrupy" and *huada*, "pumpkin or squash," because of its globular capsule.<sup>12</sup>

As an aside, the reported etymological connection between poppy (*a-fu-jung*) and lotus (*fu* or *fu-jung*) is curious for two reasons. First, this etymology is said to come through the Arab *affon* or *ufyoon*<sup>13</sup> about the 7th or 8th century.<sup>14</sup> Against this, there are religious and medical references to opium in China and Tibet, as we will see shortly, from the 1st and 3rd centuries. Second, lotus itself has both modern and ancient references as a mild sedative, especially the white lotus (*Nymphaea ampla*) or pink lotus (*Nelumbo nucifera*): "The dried flowers of certain species of *Nymphaea* and *Nelumbo* are sometimes smoked, made into a tea, or macerated in alcohol for a mild sedative effect."<sup>15</sup> W. Emboden suggests lotus was used ritually in both Mayan and Egyptian civilizations.<sup>16</sup> Lotus flowers are depicted in frescoes "from the tomb of Nebaum (XVIII dynasty, 1370-1316 B.C.)" at Luxor: "*Nymphaea* is mentioned and represented in several chapters of the book (the scroll of Ani, the Book of the Dead) always tied to magical-religious rites."<sup>17</sup> It appears on the pedestals of the Buddha and bodhisattvas in India, China, Tibet and Korea.<sup>18</sup> Homer notices lotus in Book 9 of the *Odyssey*:

and went about among the Lotus-eaters, who did them no hurt, but gave them to eat of the lotus, which was so delicious that those who ate of it left off caring about home, and did not even want to go back and say what had happened to

<sup>12</sup> Mosbach, Ernest Wilhelm. *Botanica Indigena de Chile*. Santiago, Chile: Editorial Andres Bello, 1992, p. 80, translation mine.

<sup>13</sup> Chang, p. 16; Chung, p. 147; [www.clearchinese.com](http://www.clearchinese.com).

<sup>14</sup> DEA 20026, p. 2, for example.

<sup>15</sup> From [www.erowid.org/plants/lotus/lotus.shtml](http://www.erowid.org/plants/lotus/lotus.shtml).

<sup>16</sup> See abstracts of several articles from the *Journal of Ethnopharmacology* and the *Journal of Psychoactive Drugs* at [www.erowid.org](http://www.erowid.org).

<sup>17</sup> Bertol, Elisabetta, et al. "Nymphaea cults in ancient Egypt and the New World: a lesson in empirical pharmacology" in *Journal of the Royal Society of Medicine*, v. 97 (2), Feb 2004, found at [www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1079300](http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1079300).

<sup>18</sup> See for example, [www.dangjingko.kr](http://www.dangjingko.kr), [www.travelguide.com](http://www.travelguide.com), [www.buddhanet.net](http://www.buddhanet.net).

## APPENDIX B

them, but were for staying and munching lotus with the Lotus-eaters without thinking further of their return.<sup>19</sup>

Modern experimenters with lotus typically report a "mild, opioid-like feeling."<sup>20</sup> Among the many alkaloids reported in lotus, aporphine is said to show relaxant effects in rat aorta and nuciferine can block dopamine receptors and induce narcolepsy.<sup>21</sup> The similar Chinese etymology of lotus and similar effects of *Nymphaea* suggest but do not prove a much earlier connection with *Papaver somniferum* than is normally assumed.

Ancient languages noticed *Papaver* as well. The Sumerians are said to have named it "*Hul Gil*, the joy plant" but there is also argument against this.<sup>22</sup> Says Shuck, the plant is "spoken of by Homer, who calls it *mekon*"<sup>23</sup> (the Greek *mekon* will become important later when considering the etymology of the word used for one of the plant's popular extracts, opium). According to Booth, who wrote a popular history, this may share an etymology with the Dorian *makon*, as well as the Swedish *mohn*, Polish *mak*, and East Indian *maggunad* or *maggona*.<sup>24</sup> Shuck adds that the Saxons denominated it *papeg*.<sup>25</sup>

---

<sup>19</sup> In the Samuel Butler translation found at <http://classics.mit.edu/Homer/odyssey.9.ix.html>.

<sup>20</sup> See, for example, [www.shamanic-extracts.com/scart/shamanic-ethnobotanicals/nymphaea-lotus](http://www.shamanic-extracts.com/scart/shamanic-ethnobotanicals/nymphaea-lotus).

<sup>21</sup> Chulia, S., et al. "Vasodilator effects of liriodenine and norushinsunine, two aporphine alkaloids isolated from *Annona cherimola*, in rat aorta," *Pharmacology* (1995) 50: 380-7 found at [www.ionchannels.org/showabstract.php?pmid=7568337](http://www.ionchannels.org/showabstract.php?pmid=7568337); Bhattacharya, S. K., et al. "Psychopharmacological studies on (-)-nuciferine and its Hofmann degradation product atherosperminine," *Psychopharmacology*, vol. 59, no. 1, June 1978 found at [www.springerlink.com/content/r114315V32110062](http://www.springerlink.com/content/r114315V32110062).

<sup>22</sup> "A Brief History of Opiates," in *CIN City News*, Vol. 1, Summer 1999, p.16; Merlin, pp. 154, 156.

<sup>23</sup> Shuck, p. ix (GB).

<sup>24</sup> Booth, Martin. *Opium: A History*. New York: St. Martin's Press, 1996, p. 21.

<sup>25</sup> Shuck, p. ix (GB).

## THE PLANT, *PAPAVER SOMNIFERUM* L.

### 2. ARCHAEOLOGY

Besides the linguistic evidence, there is much archeological. Its use as a medicinal plant may date back 60,000 years.<sup>26</sup> The poppy can certainly be found "in Mesopotamia at least 7000 years ago, from where it quickly spread throughout Asia and the Mediterranean."<sup>27</sup> A "considerable number of opium poppy capsules" date to 4200 BC in Granada, Spain."<sup>28</sup> The "fossilized remains of seeds and seed capsules" in an ancient Swiss lake bed have been cross-dated to 3100 BC.<sup>29</sup> Skeuomorphs (consider what the plastic lemon in your fridge might contain, for example) of the poppy capsule in the form of juglets have been dated to the Egyptian 18th Dynasty (c. 1550-1295 BC).<sup>30</sup> Gold pins in the shape of poppy heads are reliably dated from 1400-1200 BC Anatolia.<sup>31</sup>

### 3. LITERATURE

Some of the earliest Western references to the poppy "are found in Homer's works, The Iliad and The Odyssey while Hippocrates (460-357 BC) also mentions the white poppy.<sup>32</sup> Shuck writes that

---

<sup>26</sup> Chevallier, Andrew. Encyclopedia of Medicinal Plants. London: DK Publishing, 1996, p. 93.

<sup>27</sup> Hamilton, Margaret with Allan Kellehear and Greg Rumbold, editors. Drug Use in Australia. Melbourne, Australia: Oxford University Press, 1998, p. 1; Terry, Charles E. and Mildred Pellens. The Opium Problem. Montclair, NJ: Patterson Smith, 1970, p. 56, found in Merlin, Mark David. On the Trail of the Ancient Opium Poppy. London: Associated University Presses, 1984, p. 154.

<sup>28</sup> Latimer, Dean and Jeff Goldberg. Flowers in the Blood. New York: Franklin Watts, 1981, p. 16.

<sup>29</sup> Trocki, Carl A. Opium, Empire and the Global Political Economy: A Study of the Asian Opium Trade 1750-1950. London: Routledge, 1999, p. 14.

<sup>30</sup> Rudgley, Richard. The Alchemy of Culture: Intoxicants in Society. London: British Museum Press, 1993, pp. 25-26.

<sup>31</sup> Merlin, p. 162.

<sup>32</sup> DEA 20026, p.2.

## APPENDIX B

Virgil speaks of the plant using the name of *cereale papaver*, and also *cereale soporiferum*. It appears that the poppy was made to contribute to the wardrobe of the Latins, as Pliny speaks of it *papaveratae vestes*. Livy notices it, (*summa papaverum capita* etc) : and so does Ovid, (*papaverus subscat* etc).<sup>33</sup>

Shuck gives no footnotes so it is wise to check some of his sources. Virgil, speaking of a priestess who guards the shrine of the Hesperides, indeed has *spargens umida mella soporiferumque papaver* which Theodore C. Williams translates as "scatters there her slumb'rous poppies mixed with honey-dew" and Dryden as, "She poppy seeds in honey taught to steep, Reclaim'd his rage, and soothed him into sleep."<sup>34</sup> Virgil also refers to the plant in the *Georgics*: "Yet he, the while his meagre garden-herbs, Among the thorns he planted, and all round, White lilies, vervains, and lean poppy set (*Lilia, verbenasque premens vescumque papaver*), In pride of spirit matched the wealth of kings."<sup>35</sup> Shuck is also quoting Livy's *History of Rome* where King Tarquin "went into the palace-garden, deep in thought, his son's messenger following him. As he walked along in silence it is said that he struck off the tallest poppy-heads (*summa papaverum capita*) with his stick."<sup>36</sup> Dioscorides describes its growth in his *Materia Medica* around the first century AD: "A few days after the petals fall from the poppy plant, there develops a greenish pod about two inches high and nearly as

---

<sup>33</sup> Shuck, p. ix (GB).

<sup>34</sup> Maro, P. Vergilius. *Aeneid*. Book 4, 486. J. B. Greenough, editor, found in Lewis, Charlton T. and Short, Charles. *A Latin Dictionary*. Oxford: Clarendon Press, 1879 at [www.perseus.tufts.edu](http://www.perseus.tufts.edu).

<sup>35</sup> Maro, P. Vergilius. *Georgics*. Book 4, 116. J. B. Greenough, editor, found in Lewis, Charlton T. and Short, Charles. *A Latin Dictionary*. Oxford: Clarendon Press, 1879 at [www.perseus.tufts.edu](http://www.perseus.tufts.edu).

<sup>36</sup> Livy, *History of Rome*. Book I, 54. The Earliest Legends. Reverend Canon Roberts, editor, found in Lewis, Charlton T. and Short, Charles. *A Latin Dictionary*. Oxford: Clarendon Press, 1879, at [www.perseus.tufts.edu](http://www.perseus.tufts.edu).

## THE PLANT, *PAPAYER SOMNIFERUM* L.

thick."<sup>37</sup> A century later, preparations are being made from it by the physician Claudius Galen.<sup>38</sup>

In China, before the conflict of 1839-1842 the "Chinese had known poppy for more than a thousand years."<sup>39</sup> Buddhist priests from Tibet around the first century AD and the Chinese surgeon Hua To (c. 220-264 AD) are both said to have used preparations made from the plant.<sup>40</sup> Notice that this precedes the supposed introduction by the Arabs by five centuries. During the Tang dynasty (618-907 AD), poppy capsules

were being imported on Arab ships and along the caravan routes linking China with Central Asia and the Mediterranean. Travel accounts of that period bear witness to fields of the poppy plant (*yingsu*), while the poppy was mentioned in an official pharmacopeia (*bencao*) in 968.<sup>41</sup>

A recipe survives from the Song dynasty (960-1279): "The (poppy) capsule was cleaned, its outer skin removed, then dried in the shade, sliced and soaked in rice vinegar or honey."<sup>42</sup> Poppy soup made from the capsules (*yingsuke*) was used by travelers against diarrhoea in Sichuan around the same time.<sup>43</sup> The poppy is mentioned

in the *Pen-ts'ao shih-i* (Supplementary herbalist), written in the first half of the eighth century by Ch'en Ts'ang-ch'i. The Tang poet T'ao Yung of Szechwan province wrote the verse *Ma-ch'ien ch'u-chien mi-nang-hua* (In front of the horse I saw the poppy flower for the first time) in the closing years of the dynasty. ... Another reference to the plant appeared at about the same

---

<sup>37</sup> Taylor, Norman. Plant Drugs that Changed the World. New York: Dodd, Mead, 1965, p. 208 (found in Merlin, p. 256).

<sup>38</sup> Merlin, p. 93; Latimer and Goldberg, pp. 27-28.

<sup>39</sup> Chung, p. 147.

<sup>40</sup> Booth, p. 104.

<sup>41</sup> Dikötter, Frank, et. al. Narcotic Culture: A History of Drugs in China. Chicago, IL: University of Chicago Press, 2004, p. 76.

<sup>42</sup> Dikötter, et al., p. 76.

<sup>43</sup> Dikötter, et al., p. 76, quoting from Fang Shao, *Bozhai bian* (Collected work from years of wandering), orig. c.1125, Beijing: Zhonghua shuju, 1983, p. 47.



## APPENDIX B

time in *K'ai-pao pen-ts'ao* (The herbalist of the K'ai-pao period), compiled in 973 by Liu Han.<sup>44</sup>

Chang also says that the "Sung poet Su Tung-p'o (1036-1101 AD) penned the following line in a poem: 'The boy may prepare for you the broth of the poppy.' His brother Su Ch'e also wrote a poem on the cultivation of poppies for medicinal purposes."<sup>45</sup>

Dikötter, Laaman and Xun write that a formula known as "combat powder" (*doumen san*) contained "poppy capsules, Chinese angelica and root of sanguisorba." It was promoted by the "Yuan (1279-1368) physician Wang Gui ... to treat infections, abdominal pains and diarrhoea."<sup>46</sup>

So far, these are references only to the poppy plant or simple preparations from the plant. Some of these references will be revisited later when discussing the history of a simple juice extracted from the plant, opium. Naturally, every reference to opium will presume a reference to the plant but not vice versa.

### B. DESCRIPTION

It is particularly enjoyable to compare information available then, with the data available now. Jehu Lewis Shuck provides an excellent depiction of the plant in his introduction to his Portfolio Chinensis (Macao, 1840). He does not provide references in his introduction but it is clear from the accuracy and concision that in its preparation, in his own words, "authentic sources were consulted."<sup>47</sup> Here is his description of the plant:

The Poppy, *papaver*, of which there are many species, has long been, throughout the world, very extensively known. ... It is an annual plant and grows to the height of about five feet, having an erect stem, which is smooth and round and of a sea-green colour. The leaves are large, serrated, lobed and obtuse, and embrace the stem, upon which they are alternately situated. The

---

<sup>44</sup> Chang, p. 16.

<sup>45</sup> Chang, p. 16; Chung gives the dates, p. 147.

<sup>46</sup> Dikötter, et al., p. 76.

<sup>47</sup> Shuck, pp. vii-viii (GB).

## THE PLANT, *PAPAVER SOMNIFERUM* L.

flowers are large and terminal, and droop until they are expanded, when they become elevated, and the upper portion exhibits a colour of brilliant silver-grey, while a delicate violet tinges the base. Two leaves compose the calyx, and four petals the corolla. The stamens are many in number, and although the capsule has but one cell, yet it is divided by several longitudinal partitions, all of which are crowded with a multitude of seeds.<sup>48</sup>

For those not very familiar with plants, the designation of "annual" means "the plant matures one time, and does not regenerate itself. New seed must be planted each season. From a small seed, it grows, flowers, and bears fruit (a pod) only once."<sup>49</sup> For comparison, some species of *Papaver* are said to be biannual (every two years) or, like *P. alpinum* or *P. atlanticum*, perennial (living three or more years).<sup>50</sup> The number of different species is estimated between fifty<sup>51</sup> and two hundred.<sup>52</sup>

As to height and color, there are many variations. A booklet issued by the Poppy Advisory and Control Board in Tasmania, Australia (where, in some years, up to a quarter of the world's legal poppies are grown) reports that the plant in Australia attains a height of "up to 1.5 meters or more depending upon cultivar, sowing time, density and fertility status of the soil" and the flowers have four petals "pale pink to lilac in colour and commonly have a dark basal blotch."<sup>53</sup> The DEA says, speaking more of plants in Southeast Asia, "The main stem of a fully matured *Papaver somniferum* ranges between 2 and 5 feet in height. ... The lobed, dentate (jagged-edged) leaves are glaucous green with a dull gray or blue tint. ... Poppy flowers have four petals. The petals may be single or double and are either white, pink, reddish purple, crimson red, or variegated."<sup>54</sup>

<sup>48</sup> Shuck, p. ix (GB).

<sup>49</sup> DEA 20026, p. 3.

<sup>50</sup> Cheers, Gordon, editor. *Botanica: Guia ilustrado de plantas*, trans. J.G.L. Allende. Sydney: Random House Australia, 2006, pp. 634, 955.

<sup>51</sup> Cheers, p. 634.

<sup>52</sup> From [www.poppies.org](http://www.poppies.org).

<sup>53</sup> Laughlin, J.C. and D.I. Morris. Identification of Prohibited and Non-prohibited Species of Poppy Growing in Tasmania. A booklet issued to its field officers by the Poppy Advisory and Control Board, Tasmania, Australia, p. 8.

<sup>54</sup> DEA 20026, pp. 3-4.

## APPENDIX B

Tasmanian capsules are "approximately spherical, 20 to 40 mm in diameter and length with a flat, serrated non-dehiscent stigmatic disc or plate-like cap at the top."<sup>55</sup> The DEA adds that the capsules or "pods (also called seed pods, capsules, bulbs, or poppy heads) are either oblate, elongated or globular and mature to about the size of a chicken egg. The oblate pods are more common in Southeast Asia."<sup>56</sup> In the wild, in Europe, these different types of capsules often grow side by side. Cultivated poppies generally have larger capsules than wild varieties.

Dehiscent is an interesting word. Botanically, dehiscence is the "bursting open of capsules ... in order to discharge their mature contents."<sup>57</sup> The poppy plant disperses its seeds by jactitation, the "shaking of seeds (for instance, by animals or the wind) from fruits held up on relatively long stalks" and "the importance of fruit dehiscence at the appropriate time is obvious."<sup>58</sup> Wild poppies (*Papaver setigerum* L.) in Spain, for example, have closed capsules until after they flower. Later, as the capsules dry out in the sun, the "plate-like cap" separates slightly from the rest of the capsule, leaving many open slits through which the seeds fall out when the long stem is shaken.

Trocki believes that "all known varieties are cultivars (cultivated varieties)" and that the poppy is one of a half dozen plants that "can be considered to be dependent on human beings for its very existence."<sup>59</sup> Merlin argues the same from the very non-dehiscence of the cultivated plant:

Generally, within the species *Papaver somniferum*, the cultivated varieties have closed capsules, while the self-sown, semi-wild varieties ... have open

---

<sup>55</sup> Laughlin, p. 8.

<sup>56</sup> DEA 20026, p. 4.

<sup>57</sup> Sampson, J.A. and E.S.C. Weiner, preparers. The Oxford English Dictionary. 2nd Edition. Oxford: Clarendon Press, 1989, p. 401.

<sup>58</sup> Merlin, Mark David. On the Trail of the Ancient Opium Poppy. London: Associated University Presses, 1984, pp. 46-47.

<sup>59</sup> Trock, Carl A. Opium, Empire and the Global Political Economy: A Study of the Asian Opium Trade 1750-1950. London: Routledge, 1999, p. 16.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

capsules ... (the) result of artificial selection for mutated forms of the opium poppy with closed capsules to maximize seed harvests.<sup>60</sup>

One picture being worth a thousand words of description, good color photographs of the plant *Papaver somniferum* L. and its sister species can be found on many websites and in many illustrated botanical guides. Well organized websites include [www.erowid.org](http://www.erowid.org), [www.poppies.org](http://www.poppies.org), and [www.opioids.com](http://www.opioids.com). An overall introduction to *P. somniferum* and the extraction of its principal alkaloids underwritten by the DEA can be found at [www.shaps.hawaii.edu](http://www.shaps.hawaii.edu).

### C. GEOGRAPHY

From a non-commercial perspective, poppies (*P. setigerum*, *P. rhoeas*, *P. somniferum*, for example) grow wild all over the world. They can be picked beside roadways and streambeds and dried in kitchens and bedrooms and made into simple, homemade teas and tinturas in California, Hawaii, New Zealand, Australia, Spain, Switzerland, France, Argentina, Chile and Holland. Of the poppies that are deliberately cultivated, the so-called opium poppy is only one of many. Of the *P. somniferum* that is cultivated, not all is grown for commercial purposes. In all of the previous countries and more, *Papaver somniferum* is deliberately cultivated but often in home gardens as an ornamental or for medicinal use.

Of the poppy that is cultivated, much of the plant is used for its seed, petals, oil, or for decoration or ceremony. The DEA says about southeast Asian production:

Aside from being used as planting seed, poppy seed may also be pressed to produce cooking oil. Poppy seed oil may also be used in the manufacture of paints and perfumes. Poppy seed oil is straw yellow in color, odorless, and has a pleasant, almond-like taste.<sup>61</sup>

---

<sup>60</sup> Merlin, p. 47.

<sup>61</sup> DEA 20026, p. 4.

## APPENDIX B

In Tasmania the seed is mechanically separated from the straw then cleaned, packaged and sold to "the spice trade."<sup>62</sup> The stalk remaining in the field is typically used as fodder for livestock.<sup>63</sup> The dried stalk and capsule are often sold for "decorative purposes."<sup>64</sup>

Writing about 19th century Chinese cultivation, Dikötter, Laamann, Xun say

After extraction of the flower's precious sap, the poppy plant also provided fodder and seeds. The oil was particularly popular with farmers, who used it for food and lighting. The lower leaves could be prepared as food, resembling spinach in taste, while the remainder would be used as fodder. Finally, after incineration the stalk produced a sought-after dye.<sup>65</sup>

Shuck in 1840 also noted much legal cultivation of the plant "in many parts of Europe for the sake of the seeds."<sup>66</sup> Fay says that in the mid 19th century the petals were "collected, pressed into sheets the size of tortillas or the north Indian chupatti, and baked in shallow iron pans over an ordinary clay cooking oven."<sup>67</sup> These were then used with the "crushed, dried poppy stems and leaves" to encase and preserve the opium balls made at the Patna and Ghazipur factories.<sup>68</sup>

It is important to remember that all parts of the plant were being used for some purpose in the 19th century, and not just the dried sap, and that similar uses are still being made. Finally, many other species of poppy are cultivated for medicinal and decorative

---

<sup>62</sup> Galloway, John. Deputy Minister of Health, Tasmania. Unpublished notes of telephone interview; Webb, Frank. Field Officer, Poppy Advisory and Control Board. Unpublished notes from a personal interview; Smith, W. R. President, Poppy Grower's Association, Tasmania. Unpublished notes from a telephone interview.

<sup>63</sup> "General Conditions," a one-page hand-out on file at the Tasmanian Poppy and Advisory Control Board, Devonport, Tasmania.

<sup>64</sup> "Statistical," p. 79; personal observation.

<sup>65</sup> Dikötter, et al., p. 48.

<sup>66</sup> Shuck, p. x.

<sup>67</sup> Fay, pp. 12-13.

<sup>68</sup> Fay, p. 13.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

purposes, as well. A tinctura of *Papaver rhoeas* is widely sold in Spain, for example, as a calmative.<sup>69</sup>

In the sections that follow, unless otherwise noted, the focus is on the commercial cultivation for the alkaloids of the single species, *Papaver somniferum*.

### 1. 20TH/21ST CENTURY COMMERCIAL PRODUCTION

Of the *P. somniferum* that is deliberately cultivated for commerce, there are in the 21st century two main varieties: legal *P. somniferum* and illegal *P. somniferum*.

Writing in 2001, the DEA says that "the major legal (poppy growing) areas in the world today are in government-regulated (*P. somniferum*) farms in India, Turkey, and Tasmania (Australia)."<sup>70</sup> According to the INCB, in 1999 farmers in only five countries (Australia, France, India, Spain, and Turkey) grew over ninety per cent of the world's licensed *P. somniferum*.<sup>71</sup> The major illegal growing areas are "in Southwest Asia (Afghanistan, Pakistan, and Iran) and in the highlands of Mainland Southeast Asia (Burma, Laos, Vietnam, and Thailand) - popularly known as the Golden Triangle. Opium poppy is also grown (illegally) in Columbia, Mexico and Lebanon."<sup>72</sup>

The extent of global *P. somniferum* commercial cultivation is often estimated in either hectares or morphine equivalent. According to one study, global licit cultivation in 1999 was measured at roughly 141,000 hectares.<sup>73</sup> The UNODC estimated the illicit cultivation in the same year at approximately 216,000 hectares.<sup>74</sup>

---

<sup>69</sup> Personal observation.

<sup>70</sup> DEA 20026, p. 5.

<sup>71</sup> *Report of the International Narcotics Control Board for 1999*. United Nations Publications E/INCB/1999/1, p. 22. Found at [www.incb.org](http://www.incb.org).

<sup>72</sup> DEA 20026, p. 5.

<sup>73</sup> Mansfield, David. "An Analysis of Licit Opium Poppy Cultivation: India and Turkey," April 2001, p. 2, found at [www.pa-chouvy.org/Mansfield2001AnalysisLicitOpiumPoppyCultivation.pdf](http://www.pa-chouvy.org/Mansfield2001AnalysisLicitOpiumPoppyCultivation.pdf).

<sup>74</sup> "Afghanistan Opium Survey 2004," p. 27, found at [unodc.org/pdf/afg/afghanistan\\_opium\\_survey\\_2004.pdf](http://unodc.org/pdf/afg/afghanistan_opium_survey_2004.pdf).

## APPENDIX B

Supposedly, the legally cultivated *P. somniferum* for 1999 yielded some 400 metric tons of morphine equivalent.<sup>75</sup> The illegal cultivation for the same year yielded some 600 or more metric tons.<sup>76</sup> The commercial cultivation of *P. somniferum* is divided in the 21st century into legal and illegal by the international drug conventions. These treaties establish an international pharmaceutical cartel that limits legal production and spurs illegal production much like the British East India Company did some two hundred years earlier.

### 2. 19TH CENTURY COMMERCIAL PRODUCTION

*P. somniferum* was divided into the same two varieties in 1839, legal and illegal. Writing in 1840, Shuck says the poppy

which supplies nearly all Europe and America with Opium, is cultivated principally in Turkey, while almost all of the vast amount consumed in China is manufactured from the plants of India. The chief Opium regions of India are, Malwa, Benares and Patna.<sup>77</sup>

---

<sup>75</sup> Mansfield, p. 2.

<sup>76</sup> *Report*, paragraph 370, op. cit., stating that Afghanistan in 1999 produced 4600 tons, "approximately 75% of the world production of opium." This works out to 6132 tons of opium or about 613.2 tons of morphine at a morphine equivalent of 10% on average. Using the same yield factor for the illicit as for the licit yields roughly 600 metric tons of morphine equivalent. This, however, depends on whose estimate you trust. "There is no official U.S. government estimate for the outflow of drugs from source zones" and "there are no estimates of drugs of U.S. venue available in the U.S. for distribution" according to Sterling, Eric E. in "Can't Sweep This Under the Rug" quoting the *National Drug Control Strategy 1999, Performance Measures of Effectiveness: Implementation and Findings*, pp. 17-18; found at [www.nationalreview.com](http://www.nationalreview.com). The U.S. State Department, for example, estimated the same number of hectares in 1999 produced only 345 metric tons according to Mansfield, p. 2, quoting U.S. Department of State (1999) *International Narcotics Control Strategy Report*. Washington, D.C.: U.S. Government Printing Office, 1998.

<sup>77</sup> Shuck, pp. ix-x.

## THE PLANT, *PAPAYER SOMNIFERUM* L.

This Indian-grown *P. somniferum* was legal as was that of Turkey. Some of the Indian was grown under more control than others. That cultivated in Malwa (northwest India),

being under the Government of native Rajas, all persons who choose may engage in the cultivation of the poppy and the manufacture of the drug: but Benares and Patna (Bihar) belong to the East India Company, who exercise the strictest monopoly over both the cultivation and the manufacture.<sup>78</sup>

In 1839 there was also much illegal cultivation of *P. somniferum*. According to Shuck:

It is said, by Chinese writers themselves, to be cultivated in many parts of the Empire .... There are high probabilities that there has been, during the last ten years, no small increase in the cultivation of the poppy within at least six of the Provinces of China.<sup>79</sup>

As previously noticed, Waley observes that Lin always uses the word "opium" to mean "foreign opium" while he ignores "the fact that a great deal of opium was made from poppy-fields in China."<sup>80</sup> He states that before a suppression campaign in 1831, "there were extensive poppy-fields even in so accessible and thickly populated a province as Chekiang, on the south-eastern coast."<sup>81</sup> The censor Shaou Chinghwuh, a native of Chekeang province wrote a memorial to the emperor in 1830 noticing that

around all the cities, villages, hamlets, and markets, belonging to the departments named above, every place is covered with poppies; and all the inhabitants, both men and women, old and young, are employed in the production and sale of opium. Thus, within less than ten years, the evil has spread over a large part of this province .... I have heard, also, that in the provinces of Fuhkeen, Kwangtung, and Yunnan, the people produce and sell the drug ....<sup>82</sup>

---

<sup>78</sup> Shuck, p. x.

<sup>79</sup> Shuck, p. x.

<sup>80</sup> Waley, p. 26.

<sup>81</sup> Waley, p. 26.

<sup>82</sup> Slade (1839), pp. 43-44 (Documents).



## APPENDIX B

After the campaign against cultivation of poppies, "it seems ultimately to have been confined chiefly to remote districts in the outer provinces."<sup>83</sup> Chinese domestic cultivation appears to have been general knowledge at the time. The author of an article in *Blackwood's Edinburgh Magazine* noticed as an aside:

The poppy, after all, is extensively cultivated, and opium prepared in several of the Chinese provinces, and especially in Fukheen, Kwantung, Chekeang, Shantung, Yunnan, Kweichow, etc.<sup>84</sup>

Trying to compare the extent of global cultivation then with the extent of global cultivation now can be tricky. Fay, for example, says that only one factory at Ghazipur "drew on over 400,000 acres (160,000 hectares) of the poppy" in the late 19th century.<sup>85</sup> Mansfield suggests the figure for all of India in 1999 was 25,000 to 30,000 hectares.<sup>86</sup> Lin tells the emperor he soaked 2,376,254 catties of foreign opium<sup>87</sup> or approximately 1,436.5 metric tons of opium, 143.6 metric tons measured in morphine equivalent. If one assumes the same efficiency per hectare then as in the licit cultivation of 1999, then the quantity Lin processed in his vats at Chunhow would have required a little over 50,000 Indian hectares to produce. On the other hand, yields per hectare vary dramatically from season to season. Fay suggests the minimum yield was some twenty pounds of opium per acre<sup>88</sup> or roughly 22.5 kg per hectare. In 1998, the U.S. State Department used 16 kg per hectare as a global average while estimating Afghan production the same year at 33 kg per hectare. In 2000, the UNDCP used 50 kg per hectare and in 2001 only 35.7 kg per hectare.<sup>89</sup> How much of this is statistical manipulation for

---

<sup>83</sup> Waley, p. 26.

<sup>84</sup> "War with China and the Opium Question," *Blackwood's Edinburgh Magazine*, vol. XLVII, Jan.-June 1840. Edinburgh: Wm. Blackwood and Sons, 1840, pp. 378-9 (GB).

<sup>85</sup> Fay, p. 5.

<sup>86</sup> Mansfield, p. 7.

<sup>87</sup> Kuo, p. 250.

<sup>88</sup> Fay, p. 5.

<sup>89</sup> Mansfield, pp. 3-7.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

political purposes and how much direct observation is impossible to say. Just to complicate things further, the morphine (figured at 10 percent on every weight of opium) varies from country to country, season to season, field to field and even capsule to capsule on the same plant.<sup>90</sup>

### D. CULTIVATION

Methods for cultivating the plant vary between the two main varieties, as well.

#### 1. CLIMATE AND SOIL

The DEA pamphlet 20026 says that the illegal opium poppy

thrives in temperate, warm climates with low humidity and requires only a moderate amount of water before and during the early stages of growth. (It) can be grown in a variety of soils - clay, sandy loam, sandy, and sandy clay - but it grows best in a sandy loam soil.<sup>91</sup>

On the other hand, Shuck (1840) says, describing licensed Indian cultivation, that soil

of the best quality is required. The richness and quantity of the juice procurable from every head of the poppy greatly depend upon the geological and other physical conditions connected with the localities which produce the plant: such particularly as the soil, management of the irrigation, sub-soil, and the proper attentions to the distribution of the composts.<sup>92</sup>

Dikötter, Laamann and Xun describe the poppy in China in the middle of the 19th century as thriving "best on fertile but dry soils, (but) often even on top of sandstone."<sup>93</sup>

---

<sup>90</sup> "Afghanistan 2004," p. 10; Mansfield, pp. 3-7.

<sup>91</sup> DEA 20026, p. 4.

<sup>92</sup> Shuck, p. xi.

<sup>93</sup> Dikötter, et al., p. 47.

## APPENDIX B

### 2. FIELD SELECTION AND LAND CLEARING

The DEA, describing methods used today in unlicensed southeast Asian cultivation, says

Most fields are on mountain slopes (with westerly orientations) at elevations of 1,000 meters (3,000 feet) or more above sea level. Slope gradients of between 20 to 40 degrees are considered best for drainage of rainwater. In Mainland Southeast Asia virgin land is prepared by cutting and piling all brush, vines, and small trees in the field during March, at the end of the dry season. After allowing the brush to dry in the hot sun for several days, the field is set afire. ... The ash in the burnt fields is a natural source of nutrients for the soil.<sup>94</sup>

None of this "slash-and-burn or swidden agriculture"<sup>95</sup> appears to have been necessary in the legal Indian fields of the 19th century which used irrigation systems and compost, two investments not mentioned in the illegal cultivation in Southeast Asia today.

### 3. LAND PREPARATION AND CULTIVATION METHODS

Speaking of illegal cultivation in 2001 in southeast Asia, the DEA reports:

Toward the end of the rainy season in August or September, highland farmers in Mainland Southeast Asia prepare fields selected for opium poppy planting. By this time, the ash resulting from the burn-off of the previous dry season has settled into the soil, providing additional nutrients, especially potash. The soil is turned with long-handled hoes after it is softened by the rains. The farmers then break up the large clumps of soil. Weeds and stones are tossed aside and the ground is leveled off.<sup>96</sup>

The seed is then sown in several ways:

---

<sup>94</sup> DEA 20026, pp. 6-7.

<sup>95</sup> DEA 20026, p. 7.

<sup>96</sup> DEA 20026, p. 7-8.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

The opium poppy seed can be sown several ways: broadcast or tossed by hand; or fix-dropped by hand into shallow holes dug with a dibble stick, which is used to poke holes in the soil. About 1 kilogram of opium poppy seed is needed to sow 1 acre of land. Approximately 3 kilograms (6.6 pounds) of seed are used for each hectare (equivalent to 2.46 acres). The seeds may be white, yellow, coffee-colored, gray, black, or blue. Seed color is not related to the color of the flower petals. Beans, cabbages, cotton, parsley, spinach, squash, or tobacco are usually planted with opium poppy. These crops neither help nor hinder the cultivation of the opium poppy, but are planted solely for personal consumption or as a cash crop.<sup>97</sup>

By the end of October, the planting is usually completed.

Writing of the legal cultivation in India in 1840, Shuck describes a similar process but with the addition of a substantial irrigation system:

In India, many thousands of men, women and children are employed in poppy cultivation, which is, throughout, a simple process. The ground in the first place requires to be finely ploughed, and completely cleared of all the weeds. The fields are then fenced in, and divided off into many squares by means of small dykes; these small dykes are supplied with water from wells and other larger dykes, and thus the requisite amount of water is conveyed to every part of the plantation. The plant requires to be well weeded and irrigated even until it comes to maturity, as the cultivation is entirely carried on during the dry season. The seed is sown in November ....<sup>98</sup>

Fay has the sowing in India completed by "early November. In December, the poppy plants were thinned. By late January they stood two to four feet high and were coming into bloom."<sup>99</sup> The DEA says they are thinned in November and December in Southeast Asia, making the season a little earlier: "After a month of growth, when the opium poppy is about a foot high, some of the weaker plants are removed (called thinning) to allow the other plants more room to grow."<sup>100</sup>

---

<sup>97</sup> DEA 20026, p. 8.

<sup>98</sup> Shuck, p. x.

<sup>99</sup> Fay, p. 12.

<sup>100</sup> DEA 20026, p. 8.

## APPENDIX B

Describing middle 19th century Chinese cultivation, Dikötter, Laamann, Xun write that poppy cultivation "required intensive fertilization, usually achieved with soybean cakes, night-soil and ammonium sulphate, applied at least three times a year."<sup>101</sup>

In this brief recitation of the history and basic botany of the plant, the cultivators have chosen and prepared the land, sown the seed, and thinned the plantation. The plant is now almost mature, ready to flower and about to be harvested. In the next section are considered a number of possible harvesting techniques for, and a brief history of, an extractable sap, opium.

### E. SIMPLE PLANT EXTRACTIONS

For comparison, besides opium, there are many other simple plant extractions. One of the simplest is a hot water extraction, a poppy tea. From wild poppies, about a week after the petals have fallen, the capsule and top twelve inches of the stalk are clipped, bundled in packs of ten and hung upside down in a cool, dry, dark room. Within a week to ten days, the capsules are dry. The stalks are discarded, the capsules are snapped, broken, and perhaps ground while the seeds are sieved and collected to be scattered next year. A few broken capsules can be added to a tea pot, or cup. Hot water is poured over the capsules and this is allowed to steep for perhaps 10 minutes. The result is a remarkably simple and effective analgesic.

If a double handful of capsules are simmered for an hour at just below the temperature of boiling water, the liquid can be filtered and saved. The same capsules can be reheated and reused up to three times. Aficionados discard the plate-like cap and the nub at the bottom of the capsule before heating, said to be the cause of much of the bitter taste.

This method of extracting alkaloids with hot water is ancient. The Sung scholar Su Tung-p'o (1036-1101) makes reference to it in a poem: "The boy may prepare for you the broth of the poppy."<sup>102</sup> In

---

<sup>101</sup> Dikötter, et al., p. 47.

<sup>102</sup> Chang, Hsin-pao, p. 16.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

Dr. Tan Chung's translation, it is a "beverage of poppy." He continues: "This shows that the Chinese had learnt the Arab recipe of preparing from the plant a soporific beverage."<sup>103</sup> But who they learned it from can be questioned. Dikötter, et al., say a soup made from the capsules was noted by travellers in Sichuan province "as a remedy against diarrhoea" during this same period.<sup>104</sup> It is also possible to smoke directly the dried and crushed shells of the poppy heads in a pipe or rolled in a cigarette. The effect is much lighter, less effective and lasts a much shorter time. Most prefer the tea.

The dried and crushed poppy heads can be macerated in an alcohol solution of high-proof. This prepares what is known as a *tintura* which can be further concentrated by evaporating the alcohol to produce a thick, gummy black syrup in which small, grainy crystals can be seen when cooled. The preparation of strong alcohols in China is very old. Bingham in 1841 notices the widespread use of distilled alcohols:

In one house a pile of bricks, or what appeared to be bricks, excited our curiosity; for they proved on examination to be square lumps of paddy pounded up together, and then kept for the purpose of distilling *shamsoo* from them, - an ardent spirit in general use throughout China.<sup>105</sup>

What is not generally known is that wild poppies found in the Canary Islands and the Mediterranean region, and perhaps other areas as well, also contain morphine and the other alkaloids normally said to be found only in *P. somniferum*. Wild poppies, often designated *Papaver setigerum*, have been the subject of a number of interesting studies. Farmilo, et al., detected morphine in *Papaver setigerum* in 1953.<sup>106</sup> Asahina not only detected the

---

<sup>103</sup> Chung, Tan. China and the Brave New World. Durham, NC: Carolina Academic Press, 1978, p. 147, quoting from Watt's Dictionary, vol. 6, part one, p. 24.

<sup>104</sup> Dikötter, et al., p. 76.

<sup>105</sup> Bingham, p. 230 (GB).

<sup>106</sup> Farmilo, C. G., et al. "Detection of Morphine in *Papaver setigerum* DC," from [www.unodc.org/unodc/en/dat-and-analysis/bulletin/bulletin\\_1953-01-01\\_1\\_page005.html](http://www.unodc.org/unodc/en/dat-and-analysis/bulletin/bulletin_1953-01-01_1_page005.html).

## APPENDIX B

presence of morphine in the same species but measured its morphine content between 5.1 and 7.3 percent.<sup>107</sup> Panicker obtained results between 1.4 and 3.1 percent, concluding that official disinterest in the plant for commercial purposes was "justified."<sup>108</sup> Though perhaps not interesting from the standpoint of commercial production, yet the wild poppy has been and is still being used for home remedies.

### F. THE JUICE OF *P. SOMNIFERUM*, OPIUM

Opium, of course, *is* by itself another simple extraction from the plant. Its use seems to be as ancient as the plant.

#### 1. DESCRIPTION AND HISTORY

Opium is simply "the thickened juice or sap exuded from the unripe capsules of the opium poppy."<sup>109</sup> The first International Opium Convention defines it as the "spontaneously coagulated juice obtained from the capsules of the *Papaver somniferum*."<sup>110</sup> Referring to the process of harvesting, it is the "latex produced by incisions made on the still green capsules of the poppy plant."<sup>111</sup> Dr. Thomas Szasz says it best: "But opium, like the indigenous healer, is simple and unpretentious, the dried juice of the poppy."<sup>112</sup> Just as with the plant, one can examine the history of this extracted juice with linguistic, archaeological and literary evidence.

---

<sup>107</sup> Asahina, Haruyo, et al. "Studies of Poppies and Opium," from [www.poppies.org/2001/07/13analysis-of-morphine-yield-in-various-poppies](http://www.poppies.org/2001/07/13analysis-of-morphine-yield-in-various-poppies).

<sup>108</sup> Panicker, Sidi et al. "Quantitation of the Major Alkaloids in Opium from *Papaver Setigerum* DC," DEA Resources, *Microgram Journal*, Volume 5, January-December 2007, from [www.usdoj.gov/dea/programs/forensicsci/microgram/journal\\_v5\\_num14/pg2.html](http://www.usdoj.gov/dea/programs/forensicsci/microgram/journal_v5_num14/pg2.html).

<sup>109</sup> Merlin, p. 93.

<sup>110</sup> *International Opium Convention* (The Hague) 1912, Chapter 1.

<sup>111</sup> "Statistical," p. 77.

<sup>112</sup> Szasz, p. 65.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

### a. LANGUAGE

The English word "opium" is said to be derived from the Greek *opos megonos* or literally, the water or juice of the poppy.<sup>113</sup> The *opos* is almost certainly from the Sanskrit, *apas* or waters, while *megonos* or poppy, shares a common etymology, as was noted before, with the Dorian *makon*, Classical Greek *mekon*, Swedish *mohn*, Polish *mak*, and East Indian *maggunad* or *maggon*.<sup>114</sup> Early Greek references to opium often include the word "thebaicum" meaning it came from the city of Thebes, close to Luxor on the Nile river in Egypt, whose citizens were said to be famed for their knowledge of medicine. The alkaloid "thebaine" echoes this reference in the 21st century.<sup>115</sup>

In Chinese, the general term appears to have been *ya-p'ien*, believed to be a transliteration of opium, although *p'ien* is the word for tablet because "the opium extract for the pipe was (originally) in the shape of small tablets."<sup>116</sup> It may have arrived via the Arabic *af-yum* (or *ufian* or *asian*)<sup>117</sup> but as was noticed earlier in a short aside on the connection both etymologically and medicinally with lotus, this may not be so. Commissioner Lin uses the ideogram *ya-p'ien* in his edict to the foreigners of 18 March 1839 and his second letter to the queen (February 1840).<sup>118</sup> Chang lists a number of other ideograms in his glossary, depending on the particular type of opium being discussed: *chin-hua* (Turkey opium), *hsiao-t'u* (a generic term for Malwa, Turkey, and Persian opium), *hsin-shan* or *hung-jou* (Persian opium), *ku-ni* or *ku-yen* (Benares opium), *kung-pan-t'u*, *kung-yen* or *wu-t'u* (Bengal opium), *pai-p'i* or *pai-t'u* (Malwa opium), and *ta-t'u* (Bengal and Benares opium).<sup>119</sup> Shuck translates Lin's letters to the emperor using the terms *Kung pan tou* (Patna),

<sup>113</sup> Carney, p. 166; Gossop, p. 7.

<sup>114</sup> Merlin, pp. 149-150.

<sup>115</sup> Schiff, Paul L. "Opium and its Alkaloids," *American Journal of Pharmaceutical Education*, Summer, 2002, p. 1, <http://findarticles.com>.

<sup>116</sup> Chung, pp. 147-148.

<sup>117</sup> Booth, p. 21.

<sup>118</sup> Shuck, pp. 91, 132.

<sup>119</sup> Chang, pp. 302-311.



## APPENDIX B

*Pak tou* (Malwa), and *Chin hwa tou* (Persian) describing a descending order of quality.<sup>120</sup>

### b. ARCHAEOLOGY

Besides the already noted numerous findings of seeds and capsules from thousands of years ago (itself suggestive but not definitive for the use of opium), a "ceramic opium pipe was recently unearthed on the island of Cyprus off Turkey where archaeologists estimate it had been buried for some three thousand years."<sup>121</sup> The same skeuomorphs previously cited of the poppy capsule in the form of juglets from the Eighteenth Dynasty (c. 1550-1295 BC) "were probably an infusion of opium."<sup>122</sup> The reason is that such ceramic juglets shaped like a poppy capsule also come "with incision marks." An example is said to reside in London's Science Museum.<sup>123</sup> Merlin includes photographs of similar juglets with the telltale multi-blade incisions.<sup>124</sup> Equally suggestive is the the image of a bas-relief carving from Assyria of the 9<sup>th</sup> century BC "which allegedly depicts priestly physicians holding opium poppies."<sup>125</sup>

### c. LITERATURE

#### i. IN THE WEST

Opium was "probably consumed by the ancient Egyptians:"<sup>126</sup>

Thoth, the Egyptian god of letters, invention and wisdom, was said to have instructed mortal beings about opium preparation, while the goddess Isis was said to have used opium as a headache remedy for the god Ra.<sup>127</sup>

---

<sup>120</sup> Shuck, p. 247.

<sup>121</sup> Latimer and Goldberg, p. 16.

<sup>122</sup> Rudgley, pp. 25-26.

<sup>123</sup> Kabay, p. 1.

<sup>124</sup> Merlin, p. 255.

<sup>125</sup> Merlin, p. 157.

<sup>126</sup> DEA 20026, p. 2.

## THE PLANT, *PAPAVR SOMNIFERUM* L.

It was also "known to the Greeks as well."<sup>128</sup> Hippocrates (460-357 BC) recommended "drinking the juice of the white poppy mixed with the seed of nettle."<sup>129</sup> A recipe for a *theriaca* (antidote, from which is derived the English word "treacle") using opium was said to be inscribed on a stone in the Temple of Aesculapius at Cos and used by King Antiochus the Great "against all kinds of venomous animals, the asp excepted."<sup>130</sup> The first comprehensive description is said to have come from Theophrastus (371?-287? BC) in the *Historia Plantarum*.<sup>131</sup> The Greek physician Dioscorides in his *Materia Medica* describes the process of incising the plant.<sup>132</sup> Claudius Galen in the 2nd century AD named opium "one of the strongest drugs which numb the senses and induce a deadening sleep."<sup>133</sup> Both Galen and Pliny the Elder quote the same Greek recipe for *theriaca* which began, "Take two denarii of wild thyme, and the same quantity of *opopanax* and *meum* respectively ...."<sup>134</sup>

The poetry of Abu Ali al Husein Abdallah ibn Sina (Avicenna) extols the benefits of opium.<sup>135</sup> Rhazes (ca. 850-925) recommended

---

<sup>127</sup> Schiff, Paul L. "Opium and its Alkaloids," *American Journal of Pharmaceutical Education*, Summer 2002, p. 1, <http://findarticles.com>.

<sup>128</sup> DEA 20026, p. 2.

<sup>129</sup> "Opium Poppy Cultivation," DEA 20026, [www.shaps.hawaii.edu](http://www.shaps.hawaii.edu).

<sup>130</sup> Smith's *Dictionary of Roman and Greek Antiquities* found at [www.perseus.tufts.edu](http://www.perseus.tufts.edu).

<sup>131</sup> Drews, Jurgen. *In Quest of Tomorrow's Medicines*. New York: Springer-Verlag, 2003, p. 33 (GB).

<sup>132</sup> Merlin, p. 256, quoting Taylor, p. 208.

<sup>133</sup> Merlin, p. 93; Latimer and Goldberg, pp. 27-28.

<sup>134</sup> Bostock, John and H. T. Riley, editors. *The Natural History* by Pliny the Elder, Book 20 "Remedies derived from the garden plants," Ch. 100 (24) "The composition of *theriaca*," as well as Galen, *De Antidot* B, ii, c.14 though the proportions differ from those given by Pliny. *Opopanax* or *opopanax*, literally the water or juice of the seeds or kernel, references *panaces*, another Latin name for *P. somniferum* and from which the English word "panacea" is derived, found at [www.perseus.tufts.edu](http://www.perseus.tufts.edu). as well as <http://penelope.uchicago.edu>, [www.archives.nd.edu](http://www.archives.nd.edu), and <http://ablemedia.com/ctcweb/showcase/wordsonline.html>.

<sup>135</sup> Booth, pp. 21, 23, 104; "A Brief," p. 16; Latimer and Goldberg, pp. 44, 47-48.

## APPENDIX B

opium with unslaked lime and arsenic for dysentery.<sup>136</sup> In medieval Europe it was known under various "pseudonyms such as theriac, mithradatium or philonium."<sup>137</sup> In the 16th century, at Basle, Switzerland, Phillippus Aureolus Theophrastus Bombastus von Hohenheim (Paracelsus) reintroduced it (after two hundred years of Inquisition) in the form of laudanum, so named from the Latin *laudare*, or "to praise."<sup>138</sup> (Compare the choice by the Bayer company of Elberfeld, Germany made much later (1898) as a brand name for a slightly-tweaked version of just one of the opium alkaloids as *Heroin*, because it was "heroic in the fight against pain.")<sup>139</sup>

Any number of 19th century Western remedies contained opium including Mrs. Winslow's Soothing Syrup, Streets' Infants' Quietness, Atkinson's Infants' Preventive, Ayer's Cherry Pectoral, Allen's Irish Moss, Sydenham's Laudanum, paregoric, Dover's Powder, and a popular treacly preparation simply known as "black drop."<sup>140</sup> Samuel Taylor Coleridge, Charles Baudelaire, Thomas De Quincey, Sir Walter Scott, John Keats, Elizabeth Barrett Browning, Wilkie Collins, Charles Dickens, Edward Dekker, Apollinaire, Joseph Conrad, Hector Berlioz, Colette, and Jean Cocteau, wrote on opium, of it, or both.<sup>141</sup> The principal alkaloid of opium, morphine, was called by Sir William Osler "God's own medicine."<sup>142</sup> Dr. William Stewart Halsted, the "father of modern surgery," one of the four founders of Johns Hopkins University, who pioneered the use of rubber gloves, asepsis, local anesthesia, and minimizing damage to

---

<sup>136</sup> Frankenberger, Wm. T. Environmental Chemistry of Arsenic. New York: Marcel Dekker, Inc., 2002, p. 9 (GB).

<sup>137</sup> Dikötter, et al., p. 75.

<sup>138</sup> Booth, etc., op. cit.

<sup>139</sup> From wikipedia.

<sup>140</sup> Booth, p. 29; Manderson, pp. 102-103; Musto 1973, pp. 1, 94; Latimer and Goldberg, p. 51.

<sup>141</sup> Liedekerke, pp. 187, 190; Latimer and Goldberg, pp. 30, 51, 75-89; Trocki, p. xiii; Krivanek, p. 31; Doolan, p. 3.

<sup>142</sup> Latimer and Goldberg, p. 56.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

delicate tissues, was a lifelong morphine addict, doing some of his most patient, brilliant work under the influence.<sup>143</sup>

### ii. IN CHINA

Booth writes that opium is named in the herbarium *K'ai pao pen tsao* of 973 AD as a cure for dysentery and by Su Tung-Pa' as a cure for diarrhea in 987 AD.<sup>144</sup> Medicinal works of "the 12th century alluded to a fish-shaped pill made of opium powder which was extremely effective in stopping dysentery, but would cause death if an over-dose was taken."<sup>145</sup> A pill with such strength is unlikely to have been made simply from the dried capsules and presupposes the knowledge to produce opium or its alkaloids in the form of a dried powder. Editions of official books of herbal remedies published in "the Chin, Yuan, and Ming dynasties did not fail to include opium and describe its medicinal uses."<sup>146</sup> During the Ming dynasty (1368-1644), "the *Yuyao yuansfang* (Collection of prescriptions from the Imperial Medicine Bureau) cited opium in nine different formulas."<sup>147</sup> In the 16th century Li Ting gives an account of how *a-fu-yong* should be prepared in his "Introduction to Medicine."<sup>148</sup> Portuguese merchants presented a Ming emperor "with two hundred catties of opium and his empress with a hundred catties."<sup>149</sup> Particular popular were "preparations such as the 'golden elixir pills' recommended in Li Shizhen's (1518-1593) *Materia medica*."<sup>150</sup> Opium "as a medicine in premodern China was always swallowed raw."<sup>151</sup>

---

<sup>143</sup> Brecher, Ch. 5; Bernheim, pp. 177-8; Penfield, p. 2215.

<sup>144</sup> Booth, pp. 21, 23, 104; "A Brief," p. 16; Latimer and Goldberg, pp. 44, 47-48.

<sup>145</sup> Chung, p. 147.

<sup>146</sup> Chang, p. 16.

<sup>147</sup> Dikötter, et al., p. 76.

<sup>148</sup> Booth, pp. 21, 23, 104; A Brief, p. 16; Latimer and Goldberg, pp. 44, 47-48.

<sup>149</sup> Chang, p. 17.

<sup>150</sup> Dikötter, et al., p. 76.

<sup>151</sup> Chang, p. 16.

## APPENDIX B

As an aside, in the India of the 19th century it was also generally taken in this manner. Members of the Third Bombay Native Infantry, for example, during a halt

would break themselves up into small groups of four or five, and sit for awhile, and then one of the group in a quiet way take from his pocket a little lump of opium and proceed to divide it with those sitting with him; and there they would sit awhile meditating, swallowing the opium and meditating; and by the time the halt was at an end and the regiment reformed and marched on, they were fully refreshed and perfectly steady.<sup>152</sup>

Opium was eaten in India but it was also drunk: "Rajput camel drivers fortified themselves with opium water before setting off across the deserts of Sind."<sup>153</sup>

In 19th century England doctors prescribed opium in water or alcohol:

It was tincture of opium that the druggist handed De Quincey when the latter tried to get relief from the neuralgic pains of the head and face that were torturing him. Coleridge began taking laudanum (camphorated tincture of opium) about the same time and for much the same reason.<sup>154</sup>

However, sometime during the Ming dynasty (1368-1644)<sup>155</sup> a new item "was imported by foreign tributary missions, named *wu-hsiang* (black perfume) or *wu-yen* (black smoke). This was actually opium."<sup>156</sup> Similarly, *ya-p'ien* became *ya-p'ien-yen*, or opium smoke.<sup>157</sup> The names suggest the change in ingestion method from eating or drinking to smoking. The Dutch are credited with introducing opium for smoking into China sometime between 1620 and 1660, "first to their trade ports in Taiwan, from there to Fujian" province.<sup>158</sup>

---

<sup>152</sup> Fay, p. 7.

<sup>153</sup> Fay, p. 7.

<sup>154</sup> Fay, p. 6.

<sup>155</sup> Dikötter, et al., p. 76.

<sup>156</sup> Chung, p. 147.

<sup>157</sup> Chung, pp. 147-148; Dikötter, et al., p. 34.

<sup>158</sup> Dikötter, et al., p. 32; Chang, p. 16.

## THE PLANT, *PAPAYER SOMNIFERUM* L.

This change happens just after the introduction of tobacco into China. It probably arrived via Java, where it had become "an important additive to the betel chew, along with areca, betel and lime."<sup>159</sup> Snuff, tobacco for sniffing, is supposed to have been introduced into China "by the Jesuit Matteo Ricci in 1581."<sup>160</sup> European traders introduced tobacco for smoking (*danronguo*, *daubagu*, *yuncao*) "in the Wanli period (1573-1620), probably on Spanish or Portuguese vessels from Manila and through the ports in Fujian."<sup>161</sup> This is important because originally opium was not smoked by itself but was smoked mixed with tobacco.<sup>162</sup> The opium was heated in a small copper pan until it turned into a very thick paste and was then blended with local plants including betel leaf, hemp, and tobacco, a mixture known as *madak*.<sup>163</sup>

Many theories have been proposed for this change in the method of ingestion in China from eating or drinking opium to smoking it, including addictivity, hedonism, escapism, status, a "well-to-do leisure class," "stifled creative activities" and "no one can really say."<sup>164</sup> It is, says Chang, "an anomaly awaiting further investigation."<sup>165</sup>

As a separate and alternative hypothesis for this change, it should be noticed that the changeover takes place at roughly the same time as numerous prohibitory "bans (on tobacco) passed by the Manchus already before their conquest of China in 1644."<sup>166</sup> The Chinese people may have "responded by mixing opium with tobacco" possibly in order to hide the distinctive odor.<sup>167</sup> A similar early prohibition of tobacco in Europe accompanies the mixing of illegal tobacco with then legal cannabis so as to obscure the smell, a

---

<sup>159</sup> Dikötter, et al., p. 25.

<sup>160</sup> Dikötter, et al., p. 25.

<sup>161</sup> Dikötter, et al., p. 25-26.

<sup>162</sup> Chang, p. 16.

<sup>163</sup> Dikötter, et al., pp. 32, 33, 37; Fay, p. 7; Chang, p. 16; Chung, p. 156.

<sup>164</sup> Chang, pp. 16-17; Chung, pp. 149-150; Fay, p. 7.

<sup>165</sup> Chang, p. 16.

<sup>166</sup> Dikötter, et al., p. 26.

<sup>167</sup> Schiff, Paul L. "Opium and its Alkaloids," *American Journal of Pharmaceutical Education*, Summer, 2002, p. 2 from <http://findarticles.com>.

## APPENDIX B

practice still popular today but for the opposite reason: the legality of tobacco and the illegality of cannabis. Cannabis, opium and tobacco each produce a particularly pungent and distinctly recognizable odor when smoked. Thus, it could be argued that it was in fact the prohibitory law itself that caused the change.

After many useless attempts at failed and counter-productive prohibitions, tobacco was accepted both in Europe and China. At this time, opium was not prohibited in Europe. It was formally prohibited (when mixed with tobacco) in China for the first time in 1729 by an edict which banned "the importation of opium for (use in) *madak*."<sup>168</sup> In the same year, Chen Yuan purchased opium at a pharmacy and was arrested. His defense was that he purchased the opium for medical reasons. The official verdict was that

opium is a pharmaceutical substance required by medical practitioners. Only when it is blended with tobacco can it become harmful and lead to lustful acts: it can then be referred to as an illegal item.<sup>169</sup>

The historian Xiao Yishan explains the later changeover to the smoking of pure opium, not opium mixed with tobacco, by the

edicts against smoking (opium with tobacco, *madak*) which were enforced in Fujian and Guangdong [and] prompted local users to resort to pure opium instead, the use of which could be justified for medical reasons.<sup>170</sup>

Just as the Ch'ing dynasty edicts against tobacco can be argued to have spurred the use of opium to hide the smell of the burning tobacco, so the later edicts against *madak* could be said to have spurred the change to smoking pure opium.

Again, many other competing theories have been advanced to explain this second changeover in China to the smoking of pure opium including wealth and social mobility, status, conspicuous

---

<sup>168</sup> Dikötter, et al., p. 38.

<sup>169</sup> Chung, p. 156; Dikötter, et al., p. 38, quoting Wang Hongbin, *Jindu shijian* (Historical evidence about the prohibition movement), Changsha: Yuelu shushe, 1997, pp. 17-19.

<sup>170</sup> Dikötter, et al., p. 38.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

consumption, hedonism, escapism, addiction, increased morphine content, ritual, "a higher and keener pleasure" and sex.<sup>171</sup> Counter-evidence comes from H. B. Morse, author of a five-volume history of the British East India Company, writing "it is probable that opium was not much, if at all, smoked by itself before the year 1800."<sup>172</sup> Dikötter, Laamann, Xun suggest the change might have been the result of a "stricter ban on trade during the 1790s (when) high quality Patna successfully replaced poor-quality Malwa."<sup>173</sup> This would not explain why the habit persists and augments during the 1830s when Malwa overtakes Patna.<sup>174</sup> What is certain is that once again this change from the smoking of tobacco with opium to opium alone is accompanied by stricter enforcement of old prohibitions on the smoking of *madak* and enforcement of new bans on opium importation and opium itself.

Smoking opium has, of course, certain advantages over eating or drinking it, most notably safety. Eating or drinking an overdose of opium can kill:

At that moment in Middlemarch when his tormentor Raffles lies dying, it is an "almost empty opium phial" that Bulstrode puts out of sight lest Lydgate discover that his patient has been given an overdose.<sup>175</sup>

Many deliberately have chosen to end their lives in this manner. In the 1930s there is expert testimony before the League of Nations that "eating opium or dross was more harmful than smoking prepared opium, since much larger quantities of morphine entered the system" than by smoking.<sup>176</sup>

Smoking, by contrast, allows opium to be "titrated in small quantities (just as it does with cannabis) thanks to the sophisticated mechanism of the opium pipe."<sup>177</sup> Indeed, Fay asks "why Indians (or

---

<sup>171</sup> Dikötter, et al., p. 38; Fay, p. 8; Chang, p. 16; Chung, p. 149-150.

<sup>172</sup> Dikötter, et al., p. 40.

<sup>173</sup> Dikötter, et al., p. 40.

<sup>174</sup> Chung, pp. 84-85.

<sup>175</sup> Fay, p. 6.

<sup>176</sup> Dikötter, et al., p. 57.

<sup>177</sup> Dikötter, et al., p. 78.



## APPENDIX B

Europeans for that matter) did not make the same experiment and arrive at the same result."<sup>178</sup> But why ration an abundant article? What is obvious is that opium was legal and plentiful in India and Europe throughout this time period while illegal and in short supply in China. Instead of looking for long and involved explanations for this shift from eating to smoking in China based on race, class, purity, addictivity, or sex, it may be simpler to first consider the very rational alteration in behavior engendered by the prohibitory Chinese laws themselves.

### 2. HARVESTING

Of the eighteen countries in the 21st century which are licensed by the INCB to cultivate the opium poppy, four<sup>179</sup> continue to harvest by hand to produce opium. The others<sup>180</sup> harvest mechanically in order to produce concentrate of poppy straw. By contrast, all of the countries which cultivate unlicensed *Papaver somniferum* harvest manually for opium. In the 19th century, this was the only commercial method in use. This method is labor intensive: "as many as one million people are employed in the harvesting of approximately 25,000 to 30,000 hectares" by hand in India, while "less than 1,000 are involved in growing (and mechanically harvesting) approximately 20,000 hectares" in Tasmania, Australia.<sup>181</sup>

An early description of the process of incising the plant comes from the Greek physician Dioscorides in his *Materia Medica* around the first century AD:

A few days after the petals fall from the poppy plant, there develops a greenish pod about two inches high and nearly as thick. When still unripe,

---

<sup>178</sup> Fay, p. 8.

<sup>179</sup> China, Democratic Republic of Korea, India and Japan, according to Mansfield, p. 1.

<sup>180</sup> Australia, Austria, Czech Republic, Estonia, France, Germany, Hungary, Netherlands, Poland, Romania, Slovakia, Spain, The Former Yugoslav Republic of Macedonia and Turkey, according to Mansfield, p. 1.

<sup>181</sup> Mansfield, p. 7; Committee, p. 4.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

this pod is delicately slit with a many-bladed knife. The cuts must not puncture the pod or touch the seeds within it. From these shallow cuts exudes a milky juice the coagulation of which is fairly rapid. This coagulated mass is crude opium.<sup>182</sup>

Not much has changed in some 2000 years. The DEA describes much the same process being used today. Harvesting still begins after the plant has flowered. *P. somniferum* generally flowers "after about 90 days of growth" and continues to flower "for 2 to 3 weeks. The petals eventually drop to reveal a small, round green pod which continues to develop."<sup>183</sup> In the wall of the pod is secreted a white gummy latex: "Farmers harvest the opium from each pod while it remains on the plant by making vertical incisions with a specially designed homemade knife."<sup>184</sup> McCoy adds that the Meo of Phou Wei in Northeast Laos cut in the afternoon or early evening and the "following morning scrape the congealed opium sap from the bulb's surface with a flat, dull-edged knife."<sup>185</sup>

Shuck writes in 1840 that the exuded juice is collected both in China and in India during the months of February and March, describing much the same process being used then:

The falling of the flowers from the plant is the signal for making the incisions, which is done by the cultivators, in the cool of the evening, with hooked knives, made for the purpose, in a circular manner around the capsules. From these incisions a white milky juice exudes, which is concreted into a dark brown mass by the heat of the next day's sun: and this, being scraped off every evening as the plant continues to exude it, constitutes Opium in its crude state.<sup>186</sup>

In India, Fay says the knife used to incise the poppy was called a *nashtar* or *nurnee*:

---

<sup>182</sup> Merlin, p. 256, quoting Taylor, p. 208.

<sup>183</sup> DEA, p. 4.

<sup>184</sup> DEA, p. 4.

<sup>185</sup> McCoy 1972, pp. 146-7.

<sup>186</sup> Shuck, pp. x-xi.

## APPENDIX B

It consists of four concave-faced, sharp-pointed blades tied together with cotton at about the one-thirtieth of an inch apart, the parallel lines of incisions rarely exceeding one-eighth of an inch. ... The lancers move backwards through the fields and expertly catch with their left hand the sufficiently mature capsule, draw their lancets perpendicularly over it, slip it, catch another, and so on.<sup>187</sup>

This requires both art and skill: cut too shallow and no juice exudes, too deep and the juice runs into the interior of the pod and mixes with the seeds. Says Fay:

Twenty lancers should be able to cover one acre in an afternoon. Next morning they return to collect the opium that has exuded during the night. Moving this time forwards so as not to brush against the drug-bearing capsules, they grasp a capsule in one hand, scrape its incised surface with an iron scoop held in the other, and from time to time empty the scoop into earthenware pots. Two days later the capsules are incised again at a different place. The process is repeated at intervals - perhaps as little as four times, perhaps as often as eight - until nothing more seeps out.<sup>188</sup>

A parallel for North Americans who may find this process curious or exotic might be the process of extracting maple sap from the maple tree. Indeed, one inaccurate account of opium harvesting "has the grower incising the *stalk* and attaching cups for all the world like a Vermont farmer tapping sugar maples."<sup>189</sup>

Of mid 19th century harvesting of Chinese opium, Dikötter, Laamann, Xun have found at least two methods:

Since harvesting the poppy sap required more dexterity than physical strengths, the task was taken over by women and children. ... Each capsule was incised three or four times, at intervals of two or three days, although some were exhausted by only one incision. The exuded juice would coagulate overnight on the capsules, turning brown on contact with the air. The

---

<sup>187</sup> Fay, p. 4, quoting from John Scott's *Manual of Opium Husbandry* published at Calcutta in 1877.

<sup>188</sup> Fay, pp. 4-5.

<sup>189</sup> Fay, Peter Ward. *The Opium War 1840-1842*. Chapel Hill, NC: University of North Carolina Press, 1975, p. 112, italics Fay.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

following day the brown latex would be scraped off with a pruning knife and collected in vessels, where it separated into two parts.<sup>190</sup>

The second method used is not the familiar incising but shaving:

However, in Wenzhou (Zhejiang) poppies were not incised but the outer skin was shaved off with a little plane, leaving the sap to seep out along the exposed surface. When employing the shaving method, it was imperative to collect the juice almost immediately with a hollow bamboo. Once harvested the drained residue was exposed to the air for several weeks, during which time it set into a soft brown mass.<sup>191</sup>

Shaou Chinghwuh, a censor of the Chekeang province, described to the emperor in an 1830 memorial the process of harvesting the juice:

The mode of culture, as I have heard it described, is this: the seed of the poppy is sown in the 10th month of the year; in the 4th month of the following year when the heads are formed, they are cut open and the white juice exudes. In this manner, may be obtained from one mow of land (about 6600 square feet) four of (sic) five catties (one and one-third pounds per catty), which is boiled down to the consistency of soft clay. The article thus obtained in Taechowfoo, is called the Tae juice, i.e., the juice of Taechow. There are some also who obtain opium from species of the alcea and hibiscus; and hence it is named, the juice of the alcea, or of the hibiscus. These two kinds of opium are quite like that which is brought from beyond sea ....<sup>192</sup>

### 3. PROCESSING OPIUM FOR THE CHINA MARKET

Opium, then, is nothing more than the coagulated, collected juice from the incised capsules of *P. somniferum*. It oozes out white and sticky and becomes brown and harder when exposed to the air and sun. This is crude opium. In India and in China, in the 19th century, it was further prepared for the Chinese market.

---

<sup>190</sup> Dikötter, et al., pp. 47-48.

<sup>191</sup> Dikötter, et al., p. 48.

<sup>192</sup> Slade (1839), p. 43 (Documents).

## APPENDIX B

### a. DRYING

In India, this preparation for the Chinese market was known as inspissation:

The process of inspissation is carried on in the cool shade, and great care is observed in securing a proper jelly-like consistency, without grit or sourness, both of which are readily detected by the Chinese. When ready for market it has a smell peculiar to itself, heavy and not unpleasant, and possesses an adhesiveness which keeps it from dropping from the hand for some seconds, though the hand be in an inverted position. The Chinese carry it through another process of boiling before they use it.<sup>193</sup>

Crude opium can be eaten or smoked, but aficionados prefer it to be boiled first:

Uncooked opium contains moisture, vegetable matter, and other impurities which detract from a smooth-smoking product. The raw opium which is collected from the pod is placed in an open pot of boiling water where the sticky glob of opium alkaloids quickly dissolves. The soil, twigs, and plant scrapings remain undissolved. The solution is strained through cheesecloth to remove these impurities. The clear brown liquid, sometimes called liquid opium, is actually opium in solution. This liquid then is reheated over a low flame until the water turns to steam. When the water has evaporated, a thick paste remains. This paste is called prepared opium, cooked opium, or smoking opium and it is dried in the sun until it has a putty-like consistency. The net weight of the cooked opium is generally about 20 percent less than the original raw opium.<sup>194</sup>

As will be seen, sometimes the boiled opium may have been mixed with lime and salt by the Chinese purifiers, effectively producing a crude morphine base.

---

<sup>193</sup> Shuck, p. xi.

<sup>194</sup> DEA 20026, p. 9.

## THE PLANT, *PAPAVR SOMNIFERUM* L.

### b. PACKING

Once dried, the Indian opium was rolled into balls or formed into cakes and packed into chests for the trip to Canton:

The Bengal Opium is made into balls about the size of two fists, and covered over with a hard skin, made of the petals of the poppy, each ball having a separate apartment in the chest when sent off to market. The chest is made of mango-wood, and consists of two stories, each story containing twenty balls. In other regions of India, it is made into cakes about the size of a single fist, and packed up in dried poppy leaves, having no separate apartments in the chest. For the sake of securing their contents, the chests are always covered over with hides or coarse cloth. India produces about 40,000 chests of Opium annually - the chests varying in weight from 125 to 140 pounds.<sup>195</sup>

But opium is simply one method of extracting the alkaloids of *P. somniferum*. Another commercial method exists today, the Poppy Straw process, which is presented next only for comparison.

### G. THE POPPY STRAW METHOD

This is the method of choice used for the extraction of natural opiates by the commercial cultivators of licensed *P. somniferum* in the 20th/21st centuries in the West. It is dependent upon much mechanization. A brief description is presented here for comparison to the opium gum method. In its most simplified form, it can be compared with the ancient method of making a poppy tea or tincture.

#### 1. DESCRIPTION AND HISTORY

Poppy straw is defined by the Single convention as "all parts (except the seeds) of the opium poppy, after mowing."<sup>196</sup> Though

---

<sup>195</sup> Shuck, p. xii.

<sup>196</sup> *Single Convention on Narcotic Drugs* (New York) 1961, as amended by the 1972 Protocol, p, 2 [www.incb.org/e/conv/1961/cover/html](http://www.incb.org/e/conv/1961/cover/html).

## APPENDIX B

principally used for alkaloid extraction, poppy straw is also used for "decorative purposes."<sup>197</sup>

For over a century after Sertuerner's extraction of morphine from opium in 1805, a number of researchers, notably Tilloy, attempted to extract morphine directly from the poppy capsules, without going through the stage of harvesting the opium. Most of these were failures or simply uneconomical.<sup>198</sup>

In 1925, a young Hungarian chemist, Janos Kabay, "devised a method for the production of morphine from green poppy plants."<sup>199</sup> In this so-called "Green Process," the green poppy plants were cut, chopped and "put through a winepress and the sap collected."<sup>200</sup> However, the "harvested green poppy was not only perishable in the summer heat" but the process itself was "fully dependent on the vagaries of the climate of the (Hungarian) Great Plains;" even under optimal conditions "an unseasonal drought or a few weeks of constant rain could still decimate production."<sup>201</sup>

In the words of Kabay on his patent application for a "Method for the manufacture of opium alkaloids" of 30 November 1931:

Although the yield with this process is high and the opium alkaloids obtained are pure, the process has the disadvantage that it can be employed only at the season when the poppy plant is between the stages of blooming and maturity. This period is very short, so that it is difficult to manufacture with profit. Moreover, the cost of transporting the green plants is high, owing to the space required and to their weight, and the seed product is lost.<sup>202</sup>

---

<sup>197</sup> "Statistical Information on Narcotic Drugs," Part Four, p. 79, [www.incb.org](http://www.incb.org).

<sup>198</sup> Bayer, Istvan. "Manufacture of Alkaloids from the Poppy Plant in Hungary," dated 01/01/61, found at [www.poppies.org](http://www.poppies.org); for Tilloy, see Robiquet, "Section de Pharmacie," *Journal de Chimie, Médicale, de Pharmacie et de Toxicologie*, vol. 3. Paris: Chez Béchét Jeune, 1827, pp. 97-98 (GB).

<sup>199</sup> Bayer, p. 2.

<sup>200</sup> Kabay, John J. *Janos Kabay: The Life of an Inventor*. Harbord, Australia: John Kabay, 1990, p. 31.

<sup>201</sup> Kabay, pp. 34, 44.

<sup>202</sup> Bayer, p. 2.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

Because of these problems, Kabay decided to let the plants dry in the field before mowing. The dry poppy straw was then soaked in large vats to extract the alkaloids:

The invention depends upon the surprising discovery that the opium alkaloids can be obtained from the poppy plant even when the plant is already ripe and dry. According to the invention, the ripe and dried plant portions are, for this purpose, suitably cut up, then treated with an extracting fluid, and the extract obtained by means of the extracting fluid is treated for opium alkaloids.<sup>203</sup>

Today this is known as the Kabay, Poppy Straw, or Dry Poppy process.<sup>204</sup>

Originally, this new dry process used no "expensive organic solvents" and "extraction was carried out on the counter current principle, meaning that the oldest, alkaloid rich solvent was added to the fresh straw and fresh water washed out the last traces of the drug from the three times soaked oldest straw. A big press ... ensured that all the liquid was returned to the system."<sup>205</sup>

The process uses a variety of solvents in the 21st century:

The poppy capsules (with stalks not more than 10 cm in length) are thrashed, dried and then treated with an extracting liquid which consists of a solution of sodium bisulphite in water. The resultant aqueous extract is concentrated in vacuo using the "counter-current principle" method until it attains a syrupy consistency. The pasty substance thus obtained, which has a morphine content of 1% to 1.2%, is then treated with alcohol or other organic solvent. The solution - which, besides morphine, contains a lesser amount of other extractable material than the aqueous extract - is then distilled, yielding an

---

<sup>203</sup> Bayer, p. 2.

<sup>204</sup> "Statistical," p. 79; "A Short History," *The Tasmanian Poppy Industry*, a brochure published by the Poppy Advisory and Control Board, Devonport, Tasmania, p. 2; Kabay, pp. 66, 71.

<sup>205</sup> Kabay, pp. 75-76. The counter-current method is often used in extraction processes involving vegetable material. In schematic, the marc or residue moves in one direction while the liquid moves in the other from vat to vat. In this way, the liquid becomes more concentrated and the residue more exhausted. Barbier uses the same method, for example, to begin his extraction of morphine from opium (see Barbier, p. 4).



## APPENDIX B

extract having a morphine content of 2% to 4%. From this mixture of alkaloids in alkaline medium the morphine base can be precipitated by treating the mixture with ammonium sulphate in the presence of benzene. The product will have a morphine content of over 50%, and, by means of repeated precipitation or crystallization, it is possible to obtain from it the pure morphine base and morphine salts or semi-synthetic derivatives.<sup>206</sup>

### 2. HARVESTING

Development work "based on the Kabay process was done by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Drug Houses of Australia (DHA) during World War Two in a number of Australian States, including Tasmania."<sup>207</sup> The DHA was an Australian pharmaceutical cartel, composed of "six self-contained Associate Companies – one servicing each State – and all coordinating under Drug Houses of Australia Ltd. to service the Australian Nation."<sup>208</sup> Poppies grown on the island of Tasmania (the teardrop off the southeast corner of Australia) are put through a similar process.

In full production since the early 1970s, this system is one of the most mechanized and produces what are reported to be the highest yields per hectare in the world.<sup>209</sup> In 1999, 1455 farmers were "licensed by the Tasmanian Government" sowing roughly 20,000 hectares.<sup>210</sup> A farmer may obtain a license from the Department of Health only upon the completion of a successful application with one of only two pharmaceutical companies (GlaxoWellcome

---

<sup>206</sup> Bayer, p. 1.

<sup>207</sup> "A Short," p. 1.

<sup>208</sup> Maxwell, S. A. and staff, producers and compilers. Drug Houses of Australia, Ltd. Tasmania: L. Fairthorne and Son, Pty., Ltd., 1945, p. 7.

<sup>209</sup> Committee on Foreign Affairs. *United States Licit Opium Imports: Foreign Policy Issues*. Washington, D.C.: U.S. Government Printing Office, May 1989, p. 7; Mansfield, David. "An Analysis of Licit Opium Poppy Cultivation: India and Turkey," April 2001, p. 7, [www.pachouv.org/Mansfield2001AnalysisLicitOpiumPoppyCultivation.pdf](http://www.pachouv.org/Mansfield2001AnalysisLicitOpiumPoppyCultivation.pdf).

<sup>210</sup> Elias, David. "Law Review would be opiate for Tasmania," The Age, Section 4, Business, Saturday, 8 April, 2000, p. 2.

## THE PLANT, *PAPAVR SOMNIFERUM* L.

Australia Ltd or Tasmanian Alkaloids, a division of Johnson and Johnson). The applicant must abide by certain conditions, of which condition number five specifies that "the whole of the crop grown under this license is harvested and delivered to the company."<sup>211</sup>

The companies provide *Papaver somniferum* seed which is mechanically drilled. As well the companies provide advice as to sowing, fertilizer and pesticide rates; company field officers determine the time of harvest and organize the mechanical harvesters and covered transport trucks. The crop is harvested dry by cutting the capsule and the top four to five inches of the stalk. One of these companies, Tasmanian Alkaloids Pty Ltd., "a subsidiary of the United States Johnson and Johnson company,"<sup>212</sup> has bred "by novel innovative techniques" and patented the poppy 'Norman' which "is the first *Papaver somniferum* ever to contain thebaine and oripavine but no morphine or codeine. Norman first went commercial in 1998."<sup>213</sup>

### 3. PROCESSING

The bulk crop of both companies is received for processing at on-island facilities at Latrobe (GlaxoWellcome) and Westbury (Tasmanian Alkaloid) where the seed is mechanically separated from the straw. The seed is then cleaned, packaged and sold to "the spice trade." GlaxoWellcome "pelletise(s) for transport" the straw and ships it across the Bass Strait for further processing at its

---

<sup>211</sup> Galloway, John, Deputy Minister of Health, Tasmania. Unpublished notes of telephone interview, p. 2; "Application for Licence to Grow *Papaver Somniferum*" courtesy of the Poppy Advisory and Control Board, Devonport, Tasmania, p. 1; *Report of the International Narcotics Control Board for 1999*. United Nations Publications E/INCB/1999/1, p. 7, [www.incb.org](http://www.incb.org); "General Conditions," a one-page hand-out on file at the Tasmanian Poppy and Advisory Control Board, Devonport, Tasmania.

<sup>212</sup> *Johnson and Johnson 1996 Annual Report*, Worldwide Family of Companies, Asia-Pacific, Africa, p. 8, [http://www.jnj.com/news\\_finance/nf\\_ar\\_wwfoc.html](http://www.jnj.com/news_finance/nf_ar_wwfoc.html).

<sup>213</sup> "Management of Pain – A Growth Industry," *Tasmanian Alkaloids Poppy Grower's Bulletin*, No. 40, July, 1999, p. 2.

## APPENDIX B

facility at Port Fairy, Victoria. Tasmanian Alkaloid continues further processing at its plant in Westbury. The companies provide credit and charge the farmer against the final check. After harvesting, the licensee (the farmer) has one week to "ensure that any poppy material remaining on the land on which the crop was grown is destroyed by burning, slashing, cultivating or stocking with livestock."<sup>214</sup> There is also a small market in the leftover poppy material for garden compost.

### 4. ALKALOID EXTRACTION

At Westbury (Tasmanian Alkaloid, Johnson and Johnson) the separated poppy straw

enters our facility where the alkaloids are removed from the plant material by a warm solvent percolation system. The final product is called Concentrate of Poppy Straw (CPS). Morphine, the main component of Concentrate of Poppy Straw, is then converted into products such as Codeine, Pholcodeine and Dihydrocodeine.<sup>215</sup>

Through organic synthesis, other synthetic-controlled substances, such as tilidine hydrochloride, can also be produced.<sup>216</sup> The synthetics percodan and demerol may also be produced at this stage.<sup>217</sup>

At Port Fairy, the pelletized poppy straw also proceeds through "extraction, solvent exchange, purification and filtration" to produce "Concentrate of Poppy Straw (CPS)" which then becomes morphine sulfate and codeine phosphate. The exact details of each company's

---

<sup>214</sup> Galloway, p. 2; Smith, W. R. President, Poppy Grower's Association, Tasmania. Unpublished notes from a telephone interview, p. 3: "General," p. 1; personal observation courtesy of Frank Webb.

<sup>215</sup> "Operations," in *Tasmanian Alkaloids*, a brochure published by Tasmanian Alkaloids Pty Ltd, Westbury, Tasmania, p. 12.

<sup>216</sup> "Operations," p. 12.

<sup>217</sup> Merlin, Mark David. On the Trail of the Ancient Opium Poppy. London: Associated University Presses, 1984, p. 95.

## THE PLANT, *PAPAVER SOMNIFERUM* L.

processing, supposedly using "reticulating extraction and computerised analysis," are proprietary and closely guarded.<sup>218</sup>

### H. DISCUSSION

The connection between the plant, *Papaver somniferum* and the animal *Homo sapiens* is as ancient as it is extensive. Egyptian, Greek, Latin and Chinese all recognize it. There may be an early etymological reference to lotus, a plant with somewhat similar effects, in one of the Chinese words for poppy. Archaeological evidence suggests a knowledge of the plant dating back many thousands if not tens of thousands of years. Latin, Greek and Chinese literature contain references to the plant from at least two thousand years ago, predating the supposed introduction by the Arabs of the plant to China by some five centuries. Broth and beverages made from the plant were being used in China to treat diarrhoea around the year 1000 AD.

While *somniferum* is an annual, other poppies are not. The plant grows well in good soil but often in disturbed or poor soil as well. The capsule forms green, then peels back to expose colored petals to the sun. The capsule dries, opens holes in its shell, and seeds are dispersed by the wind or birds. Other varieties such as *rhoeas* or *setigerum* are also cultivated or gathered for the same purpose as *somniferum*. A great number of *Papaver* species are also cultivated for their seed, leaves, oil and decoration.

Commercial production of *somniferum* in the early 21st century can be divided into legal and illegal, each requiring different methods of field selection, land clearing, land preparation and cultivation. The same can be said of poppies grown commercially in the early 19th century.

A simple plant extraction, opium or poppy juice, has linguistic, archaeological and literary references nearly as old as the plant. The word opium may derive from the Greek *opos megonos*, and further back to the Sanskrit. Three thousand year old opium pipes, ceramic juglets with incision marks and friezes depicting priests

---

<sup>218</sup> Kabay, p. 34.

## APPENDIX B

holding poppies all suggest an early use of opium. The medicinal properties of opium as the universal antidote were carved in stone at the Temple of Aesculapius at Cos. Egyptian, Greek, Roman, Arab and medieval European physicians were all conversant with opium. By the 19th century, remedies containing opium were widely sold throughout Europe. The depth and breadth of the references in so many different civilizations suggest a much earlier understanding of opium in China than is normally supposed.

Opium definitely shows up in Chinese medicinal works from the tenth century. Herbal remedies from the Chin, Yuan and Ming dynasties all describe the medicinal use of opium. It is nearly always swallowed or drunk however just as it was in India or Europe. The practice of smoking opium is said to have been introduced into China by the Dutch in the early 1600s where it was mixed with tobacco during an early prohibition of tobacco by the new Manchu dynasty. A century later opium is formally prohibited but only when mixed with tobacco to form *madak*. The widespread smoking of opium by itself in China does not occur probably before 1800, coinciding roughly with the first formal prohibitions of the practice around the same time.

The juice can be harvested from the green capsule by hand either by incision or shaving. Opium was extensively produced in both China and India in the early 19th century. The Indian opium was dried to a sticky consistency before being rolled into balls or made into cakes and packed in chests taken aboard opium clippers. The Poppy Straw method mechanically harvests the dried capsules which are then processed for their alkaloids, principally codeine and morphine.

Opium has been the closest thing to a panacea in the *materia medica* of many different cultures over many thousands of years. The plant's harvested alkaloids form the structural if not the actual basis of the global pharmaceutical analgesic market in the 21st century. This brief excursion into botany and history and a comparison of 19th and 21st century commercial cultivation and production methods may help to demystify the plant and the extracted juice known as opium.

## APPENDIX C DOCUMENTS

---

### APPENDIX C. DOCUMENTS

- A. LIN'S FIRST MEMORIAL 1838 (KUO)
- B. LIN'S SECOND MEMORIAL 1838 (KUO)
- C. LIN'S THIRD MEMORIAL 1838 (KUO)
- D. LIN'S FIRST EDICT TO FOREIGNERS (SHUCK)
- E. LIN'S FIRST EDICT TO FOREIGNERS (MORRISON)
- F. LIN'S FIRST LETTER TO THE QUEEN (*CR*, VOL. 8)
- G. LIN'S FIRST MEMORIAL FROM ZHENKOU (KUO)
- H. KING'S ACCOUNT (LONDON *TIMES* 1 NOV 1839)
- I. BRIDGMAN'S ACCOUNT (*CR*, VOL. 8, 1839-1840)
- J. LIN'S SECOND MEMORIAL FROM ZHENKOU (KUO)
- K. LIN'S SECOND LETTER TO THE QUEEN (SHUCK)
- L. LIN'S SECOND LETTER TO THE QUEEN  
(CANTON PRESS)

So far, there appear to be exactly three written eyewitness accounts of the process Lin used for the opium: Lin's two memorials to the emperor written from Zhenkou (G, J) and King's and Bridgman's accounts (H, I) from their visit of 17 June 1839. Perhaps this is because it is usually taken as a given that any one of the reports is typical or that the opium was destroyed in some manner, the particular method being unimportant. One would think that there would be other eyewitnesses as well, either other foreigners or Chinese who observed the process or even part of it. Yet, the better scholars and the popular historians mention no others. Until such time as other eyewitness accounts should appear, these three will have to form the basis for knowledge about the event.

Those interested may also wish to compare the older method described in Lin's first and second memorials to the emperor in 1838 (A, B) with his stated intentions as given by either the Morrison or Shuck translations of his first edict to the foreigners in March 1839

## APPENDIX C

(D, E) or with the new process depicted in his memorials to the emperor from Zhenkou later that summer (G, J). As well, Lin's first letter to the queen of England (F) can be contrasted with two separate translations of his second (K, L). Finally, lengthy excerpts from Lin's third memorial to the emperor of 1838 (C) may provide some context for the economic nature of the basic conflict as well as background for argument as to just how severe a prohibitory law should be.

### A. LIN'S FIRST MEMORIAL 1838 (KUO)

Lin's first memorial to the emperor on the subject of opium and silver was sent off in the summer of 1838 while he was still Governor-General of Hu-Kuang province. P. C. Kuo translates it from the C. P. Y. W. S. M. and includes it as Document number 6 in his A Critical Study of the Anglo-Chinese War with Documents. Kuo introduces the document with the following:

The climax of the battle of memorials was reached when Lin Tse-hsü, Governor-General of Hu-Kuang, presented his memorials on July 10, 1838. Lin was one of the most shrewd economists of his time. He presented three successive memorials to the throne, which thundered a thrilling indictment against the grand evil of opium and eventually determined the direction of governmental action. In the first of these memorials (July 10, 1838) he agreed with Huang Tse-tsze in insisting on the punishment of the smokers of opium. After the preamble he proceeded to tabulate his concrete plans for punishment. He discussed in clear and definite terms (1) how the instruments for smoking should first be destroyed to cut off the root of the evil; (2) how local authorities should practice the one-year system to help removing (sic) the smoking habit of the people; (3) how severe penalties should be severally inflicted upon the dealers, smugglers, and owners of opium divans; (4) how the law should be first strictly enforced in places nearest to the government; (5) how constables should be held responsible for the diligent search of opium and the smoking instruments; and (6) how the regulations for trial and punishment should be decided beforehand.<sup>1</sup>

---

<sup>1</sup> Kuo, pp. 79-80.

## DOCUMENTS

The following pages are reprinted directly<sup>2</sup> from Kuo:

DOCUMENT NO. 6

219

The customs of various provinces have been established with the object to inspect if there be any contraband goods. But now opium is being imported and silver exported, while lawless persons pass them back and forth without any dread. How can it be so, unless the officers and employees of the customs shield and tolerate them after being given bribes? I most humbly think that the purpose of the establishment of officials, high and low, with their respective functions clearly distinguished, is to guard against violations of law. But, now, the violations take place among the officials themselves! The result will be that the people will increasingly lose their respect for law!

According to the existing rules, the officials who fail to detect the importation of opium to the amount of 100 catties or more are to be deprived of their salaries only for one year. If the amount be from 1000 up to 5000 catties, they are to be degraded. Those who receive bribes and willfully tolerate the traffic are simply to be deprived of their posts. Now, since the punishments for the failure at detection are light, the officials naturally think it is not an important matter, and consequently they turn the duty of inspection to the subordinate officers and employees. Thereupon these subordinate officers and employees join hands to evade the law. . . . I, your minister, humbly think that law ought to proceed from those nearest to it and that its observance by officials should be put under severe test. At the present time of rigid prohibition of opium smuggling, probably it will be impossible to warn against disrespect for law, unless the punishments for officials are first made stringent. . . .

### DOCUMENT NO. 6

C. P. Y. W. S. M. (T. K.), 2/20-26

#### THE GOVERNOR-GENERAL OF HU-KWANG PROPOSES RIGID PROHIBITION OF OPIUM

*(Memorial of Lin Tsé-hsü, Governor-General of Hu-Kwang,  
July 10, 1838)*

I most humbly think that opium is having its pernicious influence in China, and that silver bullion is being drained off to foreign countries. Of all those holding offices under your Majesty, who does not bitterly resent this state of affairs? Hence every year there has been an abundance of proposals

---

<sup>2</sup> P. C. Kuo. *A Critical Study of the Anglo-Chinese War with Documents*. Taipei: Ch'eng Wen Publishing Co., 1970 (Originally published in Shanghai in 1935), pp. 219-226.



## APPENDIX C

220

DOCUMENT NO. 6

or memorials, accompanied by great rhetorical pomp. But with regard to the smokers of opium there has never been one recommending the use of the Grand Penalty [death penalty] as a punishment. This is, firstly, due to the fact that the Great Tsing penal code has definite provisions regarding the punishment of crimes. Recently it has also been enacted that the punishment of those who refuse to give the names of the promoters of the opium traffic shall be raised from bamboo to exile. In view of the fact that this is already a severe measure, it naturally seems absurd to impose death penalty, for then it will be indistinguishable from the Ten Crimes and not in accordance with the spirit of the Five Penalties. Secondly, there seems to be the impossibility of a complete annihilation, since those who commit the crime are too great in number. If the punishments imposed were too severe, it might easily lead to the defiance of the law. False accusations, bribes, arbitrary exactions—all kinds of political corruption might very well arise. Hence, while there are not lacking those who privately contemplate the imposition of death penalty, the present memorial stands alone in boldly recommending that measure.

But the truth is, that as the pernicious effect of opium has already reached the extreme, it is certainly impossible to prevent it merely with the old law. Were we effectively to rescue the ship of the state from ruin, it would be of no avail so long as there is no rigor. Now that your Majesty has conferred upon me the great honor by ordering me to submit my views, I, despite my unenlightened mind, have devised the following plans with the utmost care.

I think that although jurors should be fair in punishing the people by carefully discriminating between the different degrees of crimes, yet it is more important for the ruler of the nation to consider the general situation and examine its forebodings. Now the spread of the evil influence of opium in the interior regions is much like a terrific fever having penetrated into the very arteries of a patient and long distressed him. It already being apparent that common drugs can be of no avail, it naturally follows that upon certain occasions we cannot dispense with the exercise of some strong medicine to blow up the root of the sickness. Let me now return to the question of opium-smoking. To get rid of the habit of smoking is not a difficult task; what is difficult is to reform the mind. If we want to reform that mind which constantly tends to neglect

## DOCUMENTS

DOCUMENT NO. 6

221

the law, how can we refrain from promulgating laws that will threaten the mind. Furthermore, the execution of the law will not take place until after one year, while its promulgation is a long time ahead. The interval is just a good opportunity for the people to correct their former wrongdoings. It is well to recall that the *Canon of History* has observed that bad habits acquired of yore do not undergo a complete reformation and that *Tso Chuan* [*Spring and Autumn Annals*] has also remarked that when fire burns furiously people will be afraid of it and therefore none will die of it. It seems to be that all these sayings tend to confirm the principle that a great and wise ruler would punish grand crimes with grand penalties. To impose death penalty upon the present affair is certainly different from making an arbitrary law.

But the reckless smokers have fallen so deeply into that damnable habit that their spirit and aspirations have been thoroughly ruined and they spend the day in smoking, never considering what will be the fate of the future. When severe legislation is first made, to be sure, they will be frightened almost to death. But presently they will think that the limited time is yet far away and decide to stop smoking at the very last moment. When that last moment draws near, they find it impossible to part with the habit abruptly. Then the victims will still be too numerous for execution. Hence, I beg to propose that the whole length of the present year should be devoted to effecting a reformation. All officials, high and low, in the provinces should sincerely coöperate and rescue the situation with the utmost endeavor. This is the most critical moment. This legislation will be of no avail until substantial effects are secured and the pernicious habit stopped forever.

Now I beg to proceed to give my humble views and propose six items as the methods of dealing with the opium question. To the following I pray to call your Royal attention:

(1) A complete annihilation of the instruments of smoking would cut off the very root of the evil. The bamboo stick used for smoking opium is known as a pipe. To one end of the pipe is attached a special instrument, for holding and lighting opium, neatly made of clay, known as opium-bowl. All new pipes or bowls are not adapted to one's taste and can hardly satisfy one's appetite. Each smoker must use his own bowl with crust and grease long accumulated in it. The older it is, the more he values it; he would not alienate it even to his closest kin. Besides the pipe and the bowl, there are innumerable auxiliary

## APPENDIX C

222

DOCUMENT NO. 6

instruments, but they are less important, for new ones may take their places. It is the bowl alone of which every smoker has his particular one; and, more than the pipe, it is never allowed to part with him for a moment. For in case there is no pipe, the smoker can fix his particular bowl to any pipe and still can smoke. If there is no bowl, then there is no means to hold the opium and one has to stop smoking.

Now I suggest that the state and district governors should be held responsible for searching out rigorously all the bowls in their respective states and districts. The government will first make an estimate of the extent of opium smoking in different localities according to their distance from the seacoast, their facilities of communication, their population, and the extravagance or frugality of their people. It will fix a definite number of heads supposed to be there, and then it will hold the local officers responsible for searching them out and at the same time announce the methods of encouragement and punishment.

The local government will be given authority to destroy the new pipes and new bowls which need no particular calculation. But all old pipes and bowls with crust and grease accumulated in them should be closely packed up, and, with stamps on them, delivered up to the provincial government. The chief officials in the province will thereupon open the packages and destroy all before the public. Whether these are got from seizure or from voluntary surrender by the smoker or from searching, they will all be counted towards the credit of the local government. In case a locality is very populous and wealthy while the smoking instruments delivered up are very few, the governors will be at once prosecuted. On the other hand, those localities that seize a particularly great number will be duly given distinct rewards.

(2) When this proposal is adopted, all provinces should make public proclamations ordering the people to improve their habit and the one-year limit should be divided into four periods so as to make possible a graduation of penalties according to the speed of their improvement, thus preventing any delusive hopes of avoiding the law. The imposition of strictures has its primary aim in putting an end to the smoking of opium. Should the time be reached when every one ceases to smoke, what more do we demand? The whole process is no more than to govern a man by another man and it ends when the former corrects his wrong.

## DOCUMENTS

DOCUMENT NO. 6

223

When the provinces receive the instruction, their chief officials should issue proclamations making it universally and clearly known that the three months from the arrival of the instruction from the first period. Should the smokers repent within that period and decidedly refuse to smoke and pledge themselves to do so before the officials, they should be declared not guilty, after the fashion of treating those religious converts who renounce their adopted faith. But it should be noted that to pledge before the officials is not merely to speak a word. The smoker should surrender to the officials all the smoking instruments and the remaining opium preserved in his home, repent and correct his former behavior without any refrain, and procure relatives and neighbors as witnesses. Should he commit the same crime again, whether reported by others or confirmed after investigation, he will be inflicted with heavy punishments. As to those who repent and pledge before officials in the second, third, and fourth periods, although they cannot be declared entirely not guilty, yet it seems reasonable to make more lenient their punishments. But those who refuse to surrender will be heavily punished once they are discovered. For, as four seasons make one year while each season consists of three months, the time allowed is not narrow in length. If the smoker really dreads the law, he has plenty of time to improve himself. If he still cherishes delusive hopes and keeps wronging himself, such person, if judged by moral principles, should not be dealt with merely with bamboo or exile. Besides those who are seized within the first period and who are to be punished according to the foregoing rules, those caught after the first period and before the fourth, should have their penalties raised one grade each month until it finally reaches that of exile. All the detailed provisions with regard to the different degrees of exemption for those who repent and the different degrees of punishment for those who continue to commit the crime, I beg your Majesty to order the Boards to promulgate and put into execution. When this principle of graded exemption and punishment is established, it is really no pitiable thing to inflict death penalty on those reckless souls who persist to refuse repentance and fear of the law.

(3) All penalties—on the running of an opium divan, the sale of opium, and the manufacturing of smoking instruments—should be made heavier, and each should be given a definite amount of time to surrender, thus stopping the spread of the vice. Originally, those who open divans are subject to death

## APPENDIX C

penalty and the dealers in opium are subject to exile. But, lately, with the increase of the number of smokers, they ally with one another and to arrest them becomes a very difficult task. Now if heavy punishment is to be inflicted upon the smokers, the punishment of the other offenders should be correspondingly increased. But, considering that the corrupt habit is only too deeply rooted, I deem it a wise policy to require the owners of the divans to surrender within one month after the proclamation of the order all the opium and smoking instruments, whereby their punishments will be lessened. If it should happen that the said opium and smoking instruments are caught or seized, then the local authorities will either be totally exempted from any penalties or subject to a lenient punishment according as the seizure was made before or after the one month's limit. As to the dealers in opium, it is impertinent to impose upon them the one month's limit, since in the course of their travel they might not have learned of the new regulations. Instead, they should be required within three months to surrender their opium to and seek exemption from punishment from the authorities of whatever locality they may happen to travel to. In case they refuse to surrender but come to be discovered later, they should be subject to death penalties.

All the opium surrendered ought to be destroyed in the presence of the due authorities, burning it with wutung-oil and then throwing it away into the rivers. Any one who attempts to conceal it should be punished like the offender himself. As to the makers of smoking instruments, their number has greatly increased lately. The pipes are mostly made of bamboo, but occasionally also of wood. They are in general made by tobacco stores. The ends of the pipes are usually covered with gold, silver, copper, or tin; while their mouths are often decorated with gold, jade, horn, or ivory. In Kwangtung there are also sweet-cane pipes with lacquer on the outside which are considered highly valuable. Those opium-bowls that are made in Kwangtung are best when they are of foreign porcelain, and those made in the interior regions are best when they are produced in Ishing. To protect against cracking, the maker covers it with silver or tin and even ingeniously decorates it with blue or green jewels. To prevent the blocking up of the pipes, he invents a great variety of pokers and knives. The handicraftsmen welcome the business for it insures a good market, and they imitate and compete with each other in the

## DOCUMENTS

DOCUMENT NO. 6

225

manufacture of these articles. Although penalties have been imposed by law, yet they carried on the manufacture as usual. I therefore propose that they should be required to surrender all the smoking instruments they have made, within one month after the proclamation of the order, to be destroyed by the authorities. And orders should be given to tobacco shops, makers of porcelain wares, and gold and copper smiths, and also carpenters to examine one another. Those who refuse to surrender within the prescribed limit of time or who resume the same trade after the surrender will be subject to heavy penalties according to the new regulations. And those who dare to make opium-bowls good for smoking will be inflicted with death penalty. The constables who purposely conceal any such abuses will be punished in like manner.

(4) The punishment of neglected cases should be made most strict in the regions nearest to the government. The civil and military officers who are guilty of smoking should be searched out and reported by their superior officials within three months after the proclamation of the order. Should any case be found after three months which has been ignored, they will be subject to penalties particularly defined according to the circumstances. With regard to the members of their own families, it is easiest to know their conduct. A short limit of one month, therefore, should be given for the purpose of inspection. Should they neither abolish the smoking habit nor report the case to the authorities, it is apparent that they intend to conceal the offense. In the latter case, the offenders themselves will be subject to heavy penalties while the officers that conceal the offense will be deprived of their posts. As to the copyists or servants in the local governments who are guilty of smoking, they should be searched out and punished within three months; otherwise they will be deprived of their posts.

(5) The local constables should be held responsible for the search of opium or smoking instruments. It not infrequently happens that in doing so, the constables often proceed against those for whom they have had personal enmity. But the government should justify every act of theirs provided that there is sufficient testimony. And, further, the more is searched out, the more evil will be abolished. Some dispute might happen when this is first put into execution, but no matter in the world can be perfect. If the smokers detest the possible disputes and decide to stop smoking, the result will be a great blessing. As to the owners of the divans, the constables must

## APPENDIX C

226

DOCUMENT NO. 6

have known them. Should the latter refuse to report such owners of divans, it is evident that they intend to defend them. In that case, both parties should be punished in like manner, and the houses for the divans confiscated.

(6) The manner of trial should be defined beforehand. After this proposition is adopted, we need not pay great attention to the isolated localities in the interior as there are only a few smokers who may be tried easily. But our chief attention should be concentrated on the coastal regions, the commercial ports, and metropolitan centers, where the smokers of opium are innumerable. In the latter case, the local magistrates often find the cases too numerous for them to dispose of with success; even though they devote the entire day to their trial, it frequently happens that in a short time the accused has managed to satisfy his craving for opium and at a slight turn played the trick. The real question in this connection is not the trial as such but the trial of their capacity to stand the test. To decide whether one is a smoker really does not depend upon trial but upon the capacity of the man to subsist without smoking. Hence many souls may be tried at one time. It is even true that frauds may be played when only one is under trial while no cheating can be done when all are tried at one time. In a provincial metropolis, for instance, it will be expedient to select a public place where all the accused or arrested may be ordered to assemble; and then one official, not many, will be enough to proceed thence for the trial of them all. Pending the trial, every one should be thoroughly searched so that nothing—not even a bit of candy—be suffered to accompany him. After the search they will be introduced into the room and the room locked. In the room they should be seated apart without being allowed to communicate with one another. The official himself should also be attended by only one or two servants to wait upon him, and he should not leave the place for a minute. If the session is to last from about ten o'clock in the morning until after midnight, all in silence and without any exchange of queries and answers, those who are smokers will fully demonstrate themselves as such in their countenance and gesture. Those who are falsely accused may be released by a bond signed to that effect by the official in charge. If they later turn out to be actual smokers, the said official shall be held responsible for the matter.

## DOCUMENTS

### B. LIN'S SECOND MEMORIAL 1838 (KUO)

Lin's second memorial to the emperor in 1838 was also sent when he was Governor-General of Hu-Kuang province. Kuo translates the document from The Political Works of Lin Tse-hsü (1876). Kuo introduces it: "In September, Lin presented the second memorial reporting his successful proceedings in Hupeh and Hunan in prohibiting opium. Some 3,500 opium pipes and 12,000 taels of opium had been searched out."<sup>1</sup> At this point Kuo includes a long footnote that contains the memorial:

This memorial was received in Peking on October 5, 1838. It had the effect of showing the Emperor that the prohibition was not impossible of success if it was enforced with rigor; and it had the further effect of bringing Lin into the foreground as the most competent person for carrying out an antiopium campaign. The document is translated below:

"I, Lin Tse-hsü, your minister, had lately conferred with Chian Pao-cheng, Lieutenant Governor of Hunan, and Chang Yu-soong, Acting Lieutenant governor of Hupeh, on the opium question. Although penalties have not yet been defined by law at present, yet we dare not suffer any relaxation in the seizure and demand for surrender of opium. Accordingly we directed our subordinates to search and arrest the owners of divans and the dealers in opium. Meantime, we issued public notices of warning and erected a fund for making large quantities of remedial drugs. Agencies with trustworthy officers had been established in the provincial capital, Hankow, and other places for the purpose of collecting surrendered smoking instruments. In case the people surrendered their smoking properties completely and repented heartily, they were exempted from punishment, and were also given the said remedial drug in order that they might get rid of the vicious habit.

"According to the report of Kuo Chin-shen, the magistrate of Hanyang Hsien, he has arrested an opium dealer by the name of Chu Yin-sheng, who stored in the chests on board his ship more than 1,200 taels of opium and more than 800 taels of paste [solid opium melted into an oily condition and ready for smoking]. In the warehouse of Fu Ti-tsiang in Hankow he found two dealers in opium, called Ho J-sheng and Fu Kwae-fong; on account of the

---

<sup>1</sup> P. C. Kuo. A Critical Study of the First Anglo-Chinese War with Documents. Taipei: Cheng Wen Publishing Co., 1970 (reprinted from the original published in Shanghai in 1935), p. 80.



## APPENDIX C

former 350 taels of opium and on account of the latter 500 taels of the same were seized. He had also discovered that two other dealers, Tsei A-sha and Feng Fong-chin, had fled to Canton; in their chests he seized 2,070 taels of opium belonging to the former and 980 taels of the same belonging to the latter. In the warehouse of Yu Fan-sheng he arrested the dealers called Fan Yun-lung and Chun Ya-chang, the former of whom had on his account 720 taels of opium and the latter 1,250 taels of the same. Another 850 taels of opium were found beneath the bed cloth of Fan I-lung who was in flight. The dealers, Shao Chin-chang, Hsia Chang-ling, Fan Chung-ho, and others, came to surrender themselves before the magistrates. Shao Chin-chang surrendered more than 2,000 taels of opium; Hsia Chang-ling 950 taels; and Fan Chung-ho more than 360 taels.

"In all, the total of opium and paste voluntarily surrendered and seized, amounted to more than 12,000 taels and from the establishment of the agencies until the end of the sixth month last, 1,264 pipes all heavily loaded with oily matters inside, had been collected. I had, before my last departure from the provincial capital, led two officers to examine carefully what had thus been collected, and then broke them with a sword and burned them by fire. There were a great many beautiful opium-bowls and ingenious designs. In case the oily matters dropped down in this process of destruction, we mixed them with wutung-oil, thoroughly burned them, and threw them away into the midst of the rivers.

"After this destruction, the two agencies continued to collect opium and the smoking pipes. According to a report, more than 700 have been delivered up. The outer districts in the province have also been preparing their reports. But as yet no complete figures are available. They will all wait till I return to the provincial capital when a complete examination and destruction will be made. According to a despatch from Chian Pao-cheng, Lieutenant Governor of Hunan, more than 2,300 pipes had been delivered up in his province.

"Now, as I humbly reflect upon the present situation, it seems that the evil influence of opium had been so widespread in the country that almost every mouth has an appetite for it. Most local magistrates, looking at the vast extent to which the drug had spread itself among the people, unscrupulously connived at it. Fortunately, your Majesty has ordered that heavy penalties should be inflicted upon those committing the offense. Learning of the death penalty, the latter are all caught by terror and consternation. Not only the owners of divans and the dealers in opium go in flight but also the smokers themselves, abhorring the dangers of life, strive to improve themselves. Upon examining the situation, we are convinced that it is by no means irremediable. Hence our orders and warnings, upholding a policy in which toleration and punishment have been coupled with one another. We have exempted from

## DOCUMENTS

punishment those who voluntarily surrender their opium and instruments, but enforced seizure with great rigor with regard to those who attempt to conceal their misconduct. It is idle to prosecute what is gone, but it is of supreme importance to mend the future." - Translated from The Political Works of Lin Tse-hsü (Shanghai, 1876), Memorials from Hu-Kuang, Part II, Book V, pp. 5-8.<sup>2</sup>

---

<sup>2</sup> Kuo, pp. 80-82.

## APPENDIX C

### C. LIN'S THIRD MEMORIAL 1838 (KUO)

This memorial is also translated extensively by P. C. Kuo. Kuo introduces it:

For these proceedings Lin was hailed by his people as their savior, because what was difficult to do under ordinary conditions was now achieved by the Governor with a severe law. Thus led to think that the time had come for a nation-wide persecution of opium smokers, Lin presented the third memorial, the most fiery and emphatic of all the three. There was nothing more injurious to the prosperity of the nation than opium, he maintained.<sup>1</sup>

Kuo then quotes several passages from the memorial and includes much of the memorial in another long footnote:

The third memorial of Lin was charged with fiery enthusiasm, pointing out that the opium question was the one dominant question of the nation at the time. Its argument that the drain of silver as a result of the importation of opium was bringing the nation to great peril aroused the central government to action. The memorial is translated below *in extenso*:

"As I, your minister, consider the present scarcity of money, it occurs to me that the circulation of silver in the country is much the same as the flowing of a stream. It is only the mariner who would carefully investigate the depth of the river, while those who walk on the banks never make any inquiry into it. Similarly, it is only the merchants who are acquainted with the situation of the silver, while the government officials may fail to understand it fully. At the time of drought, for instance, the water in a stream is carefully kept in by means of a weir; and should it be handled with less caution, the water will all disappear. It is idle to compel the mariners to dig the bottom of the river, for even though it could pass through one part of the river-bed, who can assure that there would be no further hindrance ahead?

"The same is true of the situation of silver. During my past official career, I have secretly consulted the opinion of the merchants at Nanhow, in Soochow, and Hankow, in Hupeh, both being busy centers of commerce and prosperity. They all agree that the market is daily diminishing for all kinds of goods in the country. Those which were sold by tens of thousands of dollars twenty or thirty years ago, find now a market but half as large as before. Where does the other half go? In short, opium! The analogy of sailing a boat

---

<sup>1</sup> Kuo, pp. 80-82.

## DOCUMENTS

is again applicable. Only when the mariner notes the lowering of the surface of the water in the river can he realize the enormous amount of water that has flowed out of the weir. We should not connive at the situation because the water has not yet disappeared to such an extent as would make it impossible to sail a boat.

I frequently think that the daily need of a man can indeed be hardly estimated if he be a spendthrift. But with an average, middle-aged man, he can pass a day if he has four or five candareens of silver, and he can have plenty of everything, if he spends one mace of silver a day. But the smokers of opium have to spend one mace in addition to the common needs of clothing and food. Thus, in one year, each of them spends thirty-six taels of silver for opium. According to the report of the Board of Revenue, China has a population of over 400,000,000. Granting that one in every hundred of our people smokes opium, the yearly drain of wealth is above a hundred millions. And what will be the waste, as the actual percentage of the smokers is far beyond that?

"Huang Tse-otsze, President of the Sacrificial Court, in his memorial, has given several score millions as the yearly drain of wealth. That is in fact but a fraction of the whole. It is really unthinkable that the wealth of the interior of the country should be thus drained off year after year. And, what is worse, the smokers strive to induce their companions to the vicious habit, congratulating themselves whenever their efforts triumph. The more deeply they lose themselves in the pitfall, the more lawless they become. If we are to punish their playful attitude and to improve the corrupted social order, the paramount task is to enforce a severe law upon the smokers.

"It has often been argued that if the owners of opium divans and the dealers in opium are heavily punished, opium will come to an end and that the matter hardly will concern the smokers. This seems to be a fair argument. But in my last memorial, while I propose the increase of penalties for the former two classes of people, yet I dare not suggest any relaxation in the punishment of the latter. This is due to the fact that smokers are most numerous among the government officials. Almost eighty or ninety percent of the officials, their relatives, secretaries, copyists, and servants have a liking for opium. They are all in a position that would enable them to defend the dealers in opium if they so chose. If no fundamental means of prosecution is devised, they naturally wish the sellers of opium to be the fountain of inexhaustible supply, while it is all against nature that they would ever be willing to cut off the source. Our laws have long provided strangulation as the penalty for the owners of divans; but during the last several years we have never heard the strangulation of a person or any other serious prosecution. The laws are virtually ignored. It is thus evident that they do defend and ally

## APPENDIX C

with the dealers: the present confusion of opinion is not inattributable to this fact.

"If we now impose death penalty upon the smokers, then it would not be too heavy a punishment to make the owners of divans or the dealers in opium subject to the penalties of beheading and exposing the heads thus cut off. On the other hand, it is of no avail if heavy punishment is imposed only on the latter and very slight penalties on the former. This bears much resemblance to the case of those wanton people who are unscrupulous in doing any evil. If punishment is imposed only upon those who induce them to do the evils, and not upon themselves, they can perform the same vice in any place. Therefore I conclude that should we decide to prohibit opium, the first important step to be taken is to punish severely the smokers themselves.

"And, further, the penalties of exile and bamboo imposed upon the smokers by the law in existence - or even if they are made a little more stringent - do not actually affect their lives. Any smoker of opium, knowing that there would be no heavier penalties, consequently has altogether no sense of fear or restraint. It is almost certain that as the smokers gradually increase in number, the profit from dealing in opium will correspondingly multiply and there will be persons who would engage themselves in its pursuit even at the risk of their lives. Thus, the proposition to emphasize the punishment only of the owners of divans and the dealers in opium is ostensibly a fair and plausible argument; but in fact it is like an old prescription that would never cure a disease.

"A proverb says that at a market where men's feet are naked there will be no cobblers, and that in the neighborhood of monasteries comb-makers can make no living. Similarly, if there be no smokers of opium, how can there be any owners of divans or dealers in opium?

"It is also argued that once heavy penalties are imposed, many frauds will take place. This seems to be a good argument. But one should remember that frauds may as well take place when the penalties are lenient; they will stop only when there are no penalties to be imposed on any. If we carry on the old, lenient way, making punishment in name but not in fact, there will be no end to the performance of frauds. On the other hand, it is infinitely wiser to enforce a rigid law, cutting off all smoking within a short time. When smoking is cut off, there will be no ground for frauds to occur.

"If it is doubted whether smoking could ever be cut off, then the surrender of opium and smoking instruments at present is an immediate answer in the affirmative. If it is doubted whether all could be punished, can it be impossible to reform everyone within a year's time? The entire matter depends upon whether the prohibition is enforced with rigor. If all responsible men in the government make a united effort and take up the matter seriously,

## DOCUMENTS

we shall see everybody purifying his soul and obeying the law, so that death penalties promulgated at the beginning will hardly be needed at the end and even though they will be necessary in a few cases, the souls saved would be innumerable. If this is compared with indifference to the growth of the evil, it will instantly be apparent which is the wiser course.

"It may be recalled in this connection that the *Shun Tien* provides penalties for the wrong-doers and that the *Chow Shu* provides execution for the drunkards. The holy rulers of old established a rigid code just because they did not wish an excessive use of law. The rigor of the law constantly changes according to the magnitude of the evils to be punished. Hence the old proverb that punishments of crimes may be heavy in one age and lenient in another. It is due to the fact that the very essence of law is a prohibitory measure responsive to the particular questions of a certain age. At the time when opium was not yet widespread, the smokers only injured themselves and the penalties of exile and bamboo were sufficient. But when its evil influence has penetrated into the whole country, the effect is tremendous. Laws should be put into rigid enforcement. If left in a lax state, then after a few decades, there will be no soldier in this Central Empire to fight against invaders, nor money to bear the military expenses. Thinking about this, I cannot but abhor the dismal condition.

"The wealth of a nation is the condition of the life of its millions of people. As such it should be conserved in their behalf. If the money remains in the country, it makes little difference if it circulates among the people rather than remaining in the treasury of the government, for the wealth of the nation will thereby be kept among the people. But should it find its way to foreign lands, how can we remain indifferent to the coming of the invaders and robbers? I have always been mean and foolish. But considering the favors I have received from your Majesty, I have the fear that if the evil be suffered to grow at this critical moment, there may be no more chance for remedy. I beg to submit respectfully my humble views as aforesaid for your Majesty's consideration." - Translated from The Political Works of Lin Tse-hsü, cited above, Memorials from Hu-Kuang, Part II, Book V, pp. 9-15.

## APPENDIX C

### D. LIN'S FIRST EDICT TO THE FOREIGNERS (SHUCK)

The Baptist minister Jehu Lewis Shuck collected together, translated and printed at Macao in 1840 a number of important documents from the period in his Portfolio Chinensis: Or, a Collection of Authentic Chinese State Papers Illustrative of the History of the Present Position of Affairs in China with a Translation, Notes and Introduction. In the preface and in the introduction he writes:

All the Chinese sounds given are in the Mandarin or Court dialect, and according to Dr. Morrison's orthography. The Chinese perpendicular method of reading is adhered to, although, to accommodate it to the Translation the original is made to read from the left instead of the right side of the page, which latter is the usual manner of all native books. ...

All threatening Proclamations against the Opium trade, to curtail the evils and vastness of its increase, having failed, His Excellency Lin, with plenipotentiary powers, was despatched as high and special Commissioner from the court of Peking to Canton. He reached the city of Canton on the 10<sup>th</sup> March 1839, and forthwith commenced active investigations. The Chinese attached the most serious importance to the coming of the high Commissioner. The sequel proves the correctness of their impressions. On the 18<sup>th</sup> of March, His excellency issued his first Proclamation, Page 84.<sup>1</sup>

The following pages are reprinted directly from Shuck's Portfolio Chinensis:<sup>2</sup>

---

<sup>1</sup> Shuck, pp. vii, viii, xv.

<sup>2</sup> Shuck, pp. 84-89, 179-180.

DOCUMENTS

84

CHINESE STATE PAPERS.

[ MARCH,

所帶何貨無不全銷欲  
 一百數十隻之多不論  
 不及數十隻近年來至  
 厚是以從前來船每歲  
 夷船到廣東通商獲利甚  
 諭各國夷人知悉照得  
 書湖廣總督部堂材  
 天朝欽差大臣兵部尚

(THE first Proclamation of the High Commissioner to foreigners.  
 He demands the voluntary surrender of all their Opium.)

LIN, High Imperial Commissioner of the celestial Dynasty, a Director of the Board of War, and Governor of the Hookwang Provinces, officially proclaims to the barbarians of every nation that they may thoroughly understand.

It appears, that foreign ships come to Canton to engage in commercial intercourse, and extensive indeed are the profits which are realized. And, whereas, the vessels which, in former days, annually arrived did not amount to the number of several tens, have, of late years, reached the number of as many as a hundred and several tens; and no matter what are their imports the entire quantity can be disposed of; and of whatever



APPENDIX C

1530. ]

CHINESE STATE PAPERS.

85

得此卽無以爲命乃聽  
況茶葉大黃、外夷、若  
封、港、爾、各、國、何、利、可、圖、  
易、爾、纔、沾、得、此、利、倘、一  
皇、帝、一、視、同、仁、准、爾、貿  
尚、有、別、處、可、覓、否、我、大  
天、地、間、如、此、利、市、馬、頭、  
置、何、貨、無、不、立、辦、試、問、

goods too they desire to purchase, there are none but what they can forthwith procure. Let me ask then, if, between the whole heavens and the earth there can any where else be found such an advantageous commercial mart as this? Our Great Emperor looks upon all with the same benevolence, and permitting you to carry on your commercial dealings you consequently have been privileged to realize these profits. If once the port should be closed against you, after what profits could all you several nations then scheme? Moreover, there are our teas and rhubarb, which, if you outside barbarians cannot procure there will be no means whatever for you to support your lives. But we have allowed

爾 靳 恩 害 之 人 等 歷  
 年 惜 卽 人 鴉 財 以 數  
 年 恩 須 何 片 而 此 十  
 販 莫 畏 得 烟 害 年  
 運 大 法 將 帶 人 蟲 所  
 出 焉 利 爾 來 命 惑 得  
 洋 爾 已 國 內 乎 華 不  
 絕 等 不 不 地 查 民 義  
 不 感 可 食 騙 爾 已 之

you annually to export these commodities without the slightest unwillingness in order that you might be benefited. Than this there can be no greater favours, and you ought therefore to fear the laws. In reaping advantages for yourselves why is it that you injure others? Why do you take opium, which is not consumed in your own countries, and smuggle it into the inner land to defraud the people out of their property and inflict injuries upon their lives?

Upon examination I find, that, by means of this commodity you have been practising deception upon the flowery natives during the past several tens of years, and the gains which you have thus so unrighteously accumulated

APPENDIX C

1839. ]

CHINESE STATE PAPERS.

87

財、共、前、猶、而、已、片、吸  
 不、憤、天、可、震、所、開、食  
 可、亦、朝、偷、怒、有、烟、者  
 勝、天、例、漏、立、內、館、亦  
 計、理、禁、今、盡、地、者、議  
 此、所、尚、大、除、民、立、死  
 人、難、寬、皇、之、人、即、罪  
 心、容、各、帝、而、販、正、爾  
 所、從、口、聞、後、鴉、法、等

cannot be reckoned up. At this state of things the hearts of men, with one accord, become indignant, and toward which it will be found difficult for even Heaven itself to exercise forbearance.

In former times, the prohibitory regulations of the Celestial Dynasty inclined to clemency, and at every sea-port smuggling could still be done. But now the Great Emperor having heard of this, and quaking with wrath, has determined that an entire stop shall be put to it, and only after this is accomplished will his exertions cease. Those natives of the inner-land who deal in opium, or open dens for the smoking of it, shall forthwith be capitally punished; and those who smoke the drug shall also be adjudged as guilty of death. You who

查辦若追究該夷人積  
 之欽差大臣關防前來  
 給、平定外域、屢次立功  
 誅、是以特蒙大皇帝頒  
 一、切伎倆、早皆深悉其  
 大、臣家居閩海、於外夷  
 內、地民人、同遵法度、本  
 來、至天朝地方、卽應與

come to the realms of the Celestial Empire, as well as the natives themselves, ought unitedly to yield explicit obedience to the laws.

I, the Great Minister, have my family residence near the coast of the territory of Min,<sup>43</sup> and with the entire skill and craftiness of the outside barbarians, I have been, from an early period, thoroughly acquainted; and I am most specially indebted to the Great Emperor for bestowing upon me, on account of my repeated services on the frontiers, the seals of High Imperial Commissioner, and I now come forward to enter upon investigations here.

Having made thorough inquiry, I have fully ascertained that you, the said barbarians, during very many

APPENDIX C

1839. ]

CHINESE STAMPS PAPERS

89

年 姑 前 與 而 等 數 獨  
販 容 尚 明 誅 洋 萬 不  
賣 惟 未 申 查 之 箱 思  
之 念 知 約 爾 意 海  
罪 究 有 法 等 船 欲 口  
卽 係 此 不 現 存 私 如  
已 遠 嚴 忍 泊 有 行 此  
不 人 禁 不 伶 鴉 售 嚴  
可 從 今 教 仵 片 賣 拿

years past have been guilty of the traffic in Opium, and we could not exercise any forbearance toward you at all but for the consideration of your being men from afar. And if you have not previously known of these rigorous enforcements, at present the laws are distinctly defined to you. Still we cannot bear to put you to death without first giving you instructive admonition. Having examined, I find, that on board of your store-ships, which are now anchored at Lintin and other offings there are stored up Opium to the amount of several tens of thousands of chests, all of which you purposely desire clandestinely to sell, and you do not even fear the rigid seizures which will take place at the various ports.

L

1

論飭諭到該夷商等速  
 風火更不可測也合行  
 大、洋、不、獨、枉、費、工、貲、恐  
 毒、何、苦、貯、在、夷、薈、久、旋  
 禁、止、不、行、人、知、爲、鴉  
 處、敢、與、銷、售、此、時、鴉、片  
 各、省、亦、皆、嚴、拿、更、有、何  
 豈、復、有、人、敢、爲、護、送、而

Should there again be individuals who dare to act as convoys to you, then, in every province alike, will they all meet with stern arrest; and where then will there still be places where any one will dare to cary on the traffic with you? At the present time Opium is prohibited and unsaleable; every body is aware that it is a destructive poison. Why is it then that you take the trouble to deposit it on board of your barbarian store-ships, which you cause to remain for so long a time anchored on the high seas, not only expending your labour and property for naught, but still less can you foresee the dangers arising from the winds and the flames. However, I now proceed to issue my commands, addressing myself to you, the said barbarian merchants, that you may immediately

同甘結聲明後來船永  
 一面出具夷字漢字合  
 絕其害不得絲毫藏匿  
 呈官點驗收明燬化以  
 共若干斤兩造具清冊  
 人名下繳出若干箱統  
 數繳官由洋商查明何  
 卽遵照將躉船鴉片盡

act in obedience thereto. Do you take the Opium now on board of your store-ships and deliver the entire amount of it up to the Mandarins. Let the Hong merchants<sup>44</sup> ascertain distinctly what are the names of the individuals, and what the quantity of chests delivered up, and what is the whole amount also in catties and taels. Let a clearly defined schedule be drawn up and presented to the officers for their investigation; and having received the Opium, let it be publicly burned that its calamitous effects may be entirely put an end to. Nor must the minutest particle be stowed away and concealed.

At the same time there shall be issued a bond, conjointly in the barbarian and native<sup>44</sup> character, stating distinctly that 'ships which hereafter come will

刑、尙可、不追、既往、本大  
 斷、絕、不來、是、能悔、罪、畏  
 來者、盡數、呈繳、未來者  
 字、果、如、木、大、臣、所、諭、已  
 樣、聞、該、夷、平、日、重、一、信  
 人、卽、正、法、情、甘、服、罪、字  
 來、一、經、查、出、貨、盡、沒、官  
 不、敢、夾、帶、鴉、片、如、有、帶

never again dare clandestinely to bring Opium, but if they should bring it, as soon as it is, by examination, found out, the entire cargo shall be confiscated, and the individuals themselves will be immediately punished capitally, and which penalties for their guilt shall be willingly undergone. In the above form shall the document be.

I have understood that you, the said foreigners, usually lay great stress upon the term '*good faith*,' and if you will really comply with that which I, the Great Minister, have commanded, and will deliver up the whole quantity of the drug which has arrived, and effectually prevent the introduction of that which has not yet come, thus manifesting repentance for your crimes, and a dread of punishment, then indeed we shall take no note of the past. And I, the Great



APPENDIX C

1830. 1

CHINESE STATE PAPERS.

93

不體面。倘執迷不悟，猶  
買賣。儘可獲利致富。豈  
既不失為良夷，且正經  
懼之心。此後照常貿易。  
請酌予賞犒，以獎其悔。  
施恩，不特寬免前愆，並  
部院奏懇大皇帝格外  
臣部會同督部堂撫

Minister will then also, in conjunction with the Governor and Lieutenant Governor, memorialize and beseech the Great Emperor, who, beyond measure, exercises his benevolence, not only leniently to remit your past offenses, but we will also request that rewards may be assigned, in order to encourage your repentant and fear-stricken hearts. After this, the usual commercial dealings may be carried on, since you will not have lost your claim to the character of being good barbarians. Then indeed you may prosecute an upright and a regular trade, and, with full liberty, you may reap profits and become rich. Will not this be in the highest degree reputable!!

But if you continue wilfully obstinate, and do not arouse your moral sensibilities, and if you .....

懷亦不能任其藐玩應  
 不悛雖以天朝柔遠綏  
 三、是皆有心違抗怙惡  
 售或搪塞而繳十之二  
 中或乘間而赴他省覓  
 詭稱帶回該國投入海  
 手帶來與夷商無涉或  
 思捏稟售私或託名水

suppose by false pretenses to carry on the traffic surreptitiously; or, for a pretext, give in the name of some sailor who brought it, and who has no connexion with the foreign merchants; or, falsely assert that you have taken it back to your respective countries, or thrown it into the midst of the sea; or, embracing opportunities proceed to our other Provinces seeking to make sales; or, to hush up the matter, you deliver up one or two tenths, then will it really be evinced that you all have hearts of opposition and disobedience, being hardened in iniquity and cherishing no principles of reform. Although the Celestial Empire cherishes a soothing tenderness towards those from afar, still it cannot bear to be thus viewed with contempt and ridicule; and we ought therefore,

此 事 相 始 終 斷 無 中 止  
 本 大 臣 一 日 不 回 誓 與  
 可 比 若 鴉 片 一 日 未 絕  
 行 事 非 尋 常 查 辦 他 務  
 既 帶 此 關 防 得 以 便 宜  
 面 承 聖 諭 法 在 必 行 且  
 懲 創 此 次 本 大 臣 自 京  
 卽 遵 照 新 例 一 體 從 重

forthwith, in obedience to the tenor of the new statute, to inflict upon the whole of you alike the heaviest punishment.

At the period that I, the Great Minister, remained at the Capital, I received in person the sacred commands and instructions to the end that wherever laws existed there must they be executed. And moreover, since I have received these seals of my High Commission I am therefore empowered to the full, properly to act in the present affair, and it will not be found that the ordinary investigations of other matters can be compared to this.

If there be a single day in which the Opium remains unexterminated, then that will be the very day upon which I the Great Minister will not return. I have sworn to persevere in this matter from the beginning to the end, and on no account, in the midst of their execution. will I arrest

其交通我中原數萬里  
 艙久則封港更何難絕  
 命而有餘而且暫則封  
 召民間丁壯已足制其  
 陸官兵軍威壯盛即號  
 改悔惟利是圖非但水  
 皆勤公憤倘該夷不知  
 之理況察看內地民情

my principles of accomplishment.

Furthermore, upon inquiry, I find that the feelings of the people of the inner land are all aroused to public indignation, and if you said foreigners do not be aware, reform and repent, making gain your only aim, then not only have I the tremendous power and dignity of the naval and land forces at my command, but by calling upon the able bodied among the people, they would be more than sufficient to place your lives at my disposal. And besides, by a temporary shutting up of the holds of your ships, or by a prolonged closing of the port, what difficulty would there be in putting an entire end to your commercial intercourse? Our central territory comprises an area of several tens of thousands of miles

名而不賣鴉片之良夷  
 夷本大臣早已備記其  
 夷館中慣販鴉片之奸  
 形與眾寡之異勢哉至  
 商豈尚不知勞逸之殊  
 從此休矣爾等遠出經  
 資夷貨恐爾各國生計  
 版興百產豐盈並不藉

in extent, and in all kinds of productions is superabundant, and we stand in no need of foreign merchandise; and it may well be apprehended that the means of livelihood of your various nations will consequently fail.

You have come to a great distance to carry on trade, and how is it that you still remain unacquainted with the difference between toil and repose, and between the power of the many and that of the few!

As to those villianous barbarians who dwell in the foreign factories, habitually dealing in Opium, I, the high Commissioner, have, at an early date, drawn up a memorandum of their names, and those good barbarians who do not deal in the drug,

稟一面取具切實甘結  
 到館開導限三日內回  
 取今令洋商伍紹榮等  
 獎賞禍福榮辱皆其自  
 良夷本大臣必先優加  
 片並首先具結者卽是  
 指出奸夷責令呈繳鴉  
 亦不可不爲剖白有能

I shall also most clearly distinguish. And those too who will point out the fraudulent foreigners, and prevail upon them to surrender up their Opium, and will voluntarily come forward and sign the bond, then verily are these the good barbarians, and I, the Great Minister, will forthwith praise and amply reward them. Misery and happiness, honour and disgrace will be solely of your own personal choosing.

We now issue our orders to the Hong merchants Woo Shaouying (Howqua) and others, to repair to your factories to reason the case with you. We assign a limit of three days, within which time an answer, by petition, must be returned; and at the same time let them receive the properly prepared bond.

APPENDIX C

1839. 丁巳

CHINESE STATE PAPERS.

99

日示  
道光十九年二月初四  
諭延後悔無及特諭  
院示期收繳毋得觀望  
聽候會同督部堂撫部

And do you wait until, by joint consultation with their Excellencies the Governor and Lieutenant-Governor, a period be appointed for receiving the surrendered Opium. And cherish no delusive hopes of delay. After repentance will be utterly unavailing.

A special Proclamation.

Taoukwang nineteenth year, second moon, and fourth day. \*  
(March 18<sup>th</sup> 1839.)

\* It has been the studied and usual policy of the Chinese Authorities at Canton, to communicate with foreigners only through the Hong merchants (sometimes, but very rarely, through the local officers)—The foregoing Proclamation, however, constitutes the first exception to these rules, as it reached the foreigners directly from the Envoy himself, bearing the red seals of his high commission.

# DOCUMENTS

1840.

CHINESE STATE PAPERS.

179

Classics, and are figurative expressions meaning *reformation of feeling and habits*.

33. Page 58. The expression 'not being able to cover up men's ears and eyes,' is a common proverb, meaning, that it will be found difficult to escape observation.

34. Page 64. The Emperor of China is usually styled 天子 *Tien-tze*, The Son of Heaven, and here in the text he is spoken of as 聖天子 *Shing-Tien-tze*, The Sacred Son of Heaven.

35. Page 68. Salt in China is a Government monopoly. In every hcen there is a 鹽埠 *Yen-fow*, Salt depository, over which is placed a specially appointed officer. The 鹽運使 *Yen-yun-sze* is the Superintendent of all the salt departments of a Province, and in high official rank nearly equals that of the Provincial Judge.

36. Page 73. The 鄉紳 *Heang-shin*, seem to be a privileged class of country gentlemen who have taken the degree of *Sew-tsae*.

37. Page 73. The 紳士 *Shin-sze*, graduated scholars, are the same as those mentioned in Note thirty sixth.

38. Page 74. When village matters are to be arranged it is customary for the villagers to choose, from among themselves, a chief and a deputy. Here it should read a head of the village, or clan, or party, instead of the head &c. and a village assistant, instead of the village &c.

39. Page 74. The *mun pae*, door tablets, are the same as referred to in Note 16, Page 18.

40. Page 78. Red is the national colour of the seals of the Emperor and of all the officers of the Empire. When an Emperor dies, however, blue is the official colour used throughout the land for one hundred days.

41. Page 78. Five heads of families with a 正 *Ching*, chief, and 副 *Foo*, an assistant, make up the party of seven here alluded to.

42. Page 80. This 西關 *Se-kwan*, western pass, is in the western suburbs of Canton city, where vats were dug during 1839 for destroying Opium.

43. Page 88. 閩 *Min* is the ancient classical appellation of the Province of Fuhkeen. The Commissioner is a native of Fuhchow, the capital of the Province.

44. Page 91. The Hong Merchants are well known as the only twelve individuals in the Empire who are licensed by the Imperial government to trade with foreigners. Their responsibilities are immense. Most of them are now bankrupt.



# APPENDIX C

45. *Page 91.* The Commissioner has never feigned to manifest that contempt for foreign literature which has usually characterised his high brother officers. He has in his employ three native interpreters, who engage in translating from English into Chinese.

46. *Page 102.* Mr. Roberts was a member of the East India Company's Select Committee in Canton, and was sent by Lord Strathallen on a commercial mission to CochinChina in November 1803. Subsequently to his return a false report was circulated that the English meditated an attack upon Macao of which Mr. Roberts was one of the abettors. Upon this the Chinese authorities forbade Mr. Roberts coming to Canton, and the other members of the Committee refused to trade until the interdiction was rescinded. Mean time, while the matter was pending, Mr. Roberts died. See Davis's Chinese Vol. 1. Chap. 3.

47. *Page 102.* Lord Napier, the first Superintendent of British Trade in China after the expiration of the East India Company's Charter, landed at Macao July 18<sup>th</sup> 1834; and he reached Canton on the 25<sup>th</sup> of the same month, accompanied by all the members of his establishment, without having previously received the permission of the local Authorities. This intelligent and amiable gentleman, after most laborious and exciting labours (see Chinese Repository Vol. 3.), was taken ill in Canton, and returned to Macao, where, in the bosom of his family, he expired on the 11<sup>th</sup> Oct. 1834.

48. *Page 102.* Dr. Morrison, an English Missionary, arrived in China, via the United States, Sept. 4, 1807. At the time of his demise, which took place at Canton, August 1<sup>st</sup> 1834, in the 53<sup>rd</sup> year of his age, he was Chinese Interpreter to the Superintendents of British Trade of which Lord Napier was Chief. For particulars of the life and labours of this holy and interesting man see his Memoirs, compiled by his widow, 2 Vols. London, 1839. Also Chinese Repository Vol. 3. page 171. The death of Captain Lord John Churchill, which occurred in China on board H. M. ship *Druid*, June 3<sup>rd</sup> 1840, has also been attributed, by the Chinese, to the vengeance of offended heaven for daring to enter the waters of the Middle Kingdom. Had they been informed in relation to Col. Cathcart,\* the same story would no doubt have been duly placed 'on record'. *Page 103.* Read Newspapers of every country instead of every county.

49 instead of 48. *Page 100.* 大清朝 *Ta-tsing-chaou*, The Great Pure Dynasty. was the title assumed by Sunche, who ascended the throne of China in 1644 as the first of the Tartar Monarchs. Taoukwang, the present reigning Emperor, is the sixth of the Tartar Dynasty. See a translation of the 律例 *leai-le*, laws, by Sir George Staunton. London. 4<sup>th</sup>.

\* Col. Cathcart was sent from England as Ambassador to China in 1793, but died on his passage out in the Straits of Bunde. His monument is still seen from the anchorage at Amoy.

## DOCUMENTS

### E. LIN'S FIRST EDICT TO THE FOREIGNERS (MORRISON) AND A BRIEF HISTORY OF THE OPIUM TRADE (BRIDGMAN)<sup>1</sup>

THE

## CHINESE REPOSITORY.

---

VOL. VII.—APRIL, 1839.—No. 12.

---

*ART. I. Crisis in the opium traffic: orders from Lin high imperial commissioner for the surrender of the drug to the Chinese government; all foreigners forbidden to leave Canton; their whole trade suspended; port clearances denied to their ships at Whampoa; with a narrative of proceedings relative thereto.*

THE extraordinary growth of the traffic in opium, and its present crisis, will long remain memorable events in the annals of foreign intercourse with China. In the tariff, published near the close of the last century, opium was placed among the imports, as a medicinal drug, subject to a duty of five mace per catty. Its importation from Bengal—a plan suggested by colonel Watson, and adopted by Mr. Wheeler, vice-president in council—seldom exceeded 200 chests prior to 1767; that year it amounted to 1000, at which rate it continued a long time in the hands of the Portuguese. In 1773, the British East India Company made a small adventure. In 1781, the Bengal government freighted an armed vessel with it—the proceeds of which were to be paid into the Company's treasury in Canton. In 1794, a ship, laden exclusively with it, came to Whampoa. In 1800, it was interdicted by the Chinese government. In 1821, the traffic was driven from the port, and has since extended along the whole coast, and increased with amazing rapidity. In the summer of 1836, a high officer at court, Heu Naetse, in a memorial to the emperor, proposed its legalization, and was supported in his recommendation by the local government of Canton. In the autumn of the same year, another high officer, Choo Tsun, came forward remonstrating against

VOL. VII. NO. XII. 77

---

<sup>1</sup> Reprinted from the Chinese Repository, Vol. 7, pp. 609-615 (GB).

## APPENDIX C

610

*Crisis in the Opium Traffic.*

APRIL,

its admission, followed by Heu Kew and other. The reader will find these several documents in the former volumes of the Repository. The immediate result of them was an edict from the emperor, requiring certain foreigners to leave Canton. That edict was partially evaded, and the traffic continued through the year 1837, and until the summer of 1838—and it was said by the dealers, at that time, that the local authorities received \$75 per chest for connivance. Of the occurrences during the last twelve months, recorded in the previous numbers of this volume, it is sufficient to allude here to those of the 12th of December and the 26th of March last, the sequel of which is now to be detailed.

His excellency Lin, high commissioner from the court of Peking, arrived in this city on the 10th of March. He came with plenipotentiary powers—authorized to do whatever should seem to himself right. Born and bred in one of the maritime provinces, and having (as he says) early had intimate acquaintance with all the arts of foreigners, he was therefore, it would seem, selected for this new and difficult service. He is now about fifty-five years of age; and is described by natives (no foreigner has yet seen him) as of middling height, rather stout, and of stern demeanor. For his other qualities, as statesman, &c., his public documents and proceedings give us no unequivocal testimony. His instructions, respecting the traffic in opium, he received in person from the emperor. And report says, that the monarch—having called before him his faithful servant Lin, recounted the evils that had long afflicted his children by means of the flowing poison; and, adverting to the future, paused and wept: then, turning to the commissioner, said, “How, alas! can I die and go to the shades of my imperial father and ancestors until these direful evils are removed!” At the same time the emperor put into his hands the seal of his high commission—investing him with power (if report be true) such as has only thrice been delegated by the monarchs of the present dynasty—and then bade him *go, examine and act*. Thus charged, he came. Having made his entrance into the city, eight days were occupied with inquiries, and in preparing edicts. Late in the evening of the 18th of March, one of the foreigners (Mr. Thom) was called to Howqua’s to translate a paper to foreigners. The following appeared the next day.

No. 1.

*Edict from the imperial commissioner to foreigners of all nations.*

Lin, high imperial commissioner of the Celestial Court, a director of the Board of War, and governor of Hookwang, issues his com-

## DOCUMENTS

1839.

*Crisis in the Opium Traffic*

811

mands to the foreigners of every nation, requiring of all full acquaintance with the tenor thereof.

It is known that the foreign vessels, which come for a reciprocal trade to Kwangtung, have derived from that trade very large profits. This is evidenced by the facts,—that, whereas the vessels annually resorting hither were formerly reckoned hardly by tens, their number has of late years amounted to a hundred and several times ten; that whatever commodities they may have brought, none have failed to find a full consumption; and whatever they may have sought to purchase, never have they been unable readily to do so. Let them but ask themselves whether between heaven and earth, any place affording so advantageous a commercial mart is elsewhere to be found. It is because our great emperors, in their universal benevolence, have granted you commercial privileges, that you have been favored with these advantages. Let our ports once be closed against you, and for what profits can your several nations any longer look? Yet more,—our tea and our rhubarb,—seeing that, should you foreigners be deprived of them, you therein lose the means of preserving life—are without stint or grudge granted to you for exportation year by year beyond the seas. Favors never have been greater!

Are you grateful for these favors? You must then fear the laws, and in seeking profit for yourselves, must not do hurt to others. Why do you bring to our land the opium, which in your own lands is not made use of, by it defrauding men of their property, and causing injury to their lives? I find that with this thing you have seduced and deluded the people of China for tens of years past; and countless are the unjust hoards that you have thus acquired. Such conduct rouses indignation in every human heart, and is utterly inexcusable in the eye of celestial reason.

The prohibitions formerly enacted by the celestial court against opium were comparatively lax, and it was yet possible to smuggle the drug into the various ports. Of this the great emperor having now heard, his wrath has been fearfully aroused, nor will it rest till the evil be utterly extirpated. Whoever among the people of this inner land deal in opium, or establish houses for the smoking of it, shall be instantly visited with the extreme penalty of the laws; and it is in contemplation to render capital also the crime of smoking the drug. And you, having come into the territory of the celestial court, should pay obedience to its laws and statutes, equally with the natives of the land.

I, the high commissioner, having my home in the maritime pro-

## APPENDIX C

612

*Crisis in the Opium Traffic.*

APRIL,

vince of Fulkeen, and consequently having early had intimate acquaintance with all the arts and shifts of the outer foreigners, have for this reason been honored by the great emperor with the full powers and privileges of 'a high imperial commissioner, who, having repeatedly performed meritorious services, is sent to settle the affairs of the outer frontier.'

Should I search closely into the offenses of these foreigners, in forcing for a number of years the sale of opium, they would be found already beyond the bounds of indulgence. But, reflecting that they are men from distant lands, and that they have not before been aware that the prohibition of opium is so severe, I cannot bear, in the present plain enforcement of the laws and restrictions, to cut them off without instructive monition.

I find that on board the warehousing vessels which you now have lying at anchor in the Lintia and other offings, there are stored up several times ten thousand chests of opium, which it is your purpose and desire illicitly to dispose of by sale. You do not consider, however, the present severity of the measures in operation for seizure of it at the ports. Where will you again find any that will dare to give it escort? And similar measures for the seizure of it are in operation also in every province. Where else then will you yet find opportunity of disposing of it? At the present time the dealings in opium are brought utterly to a stand, and all men are convinced that it is a nauseous poison. Why will you be at the pains then of laying it up on board your foreign store-ships, and of keeping them long anchored on the face of the open sea, not only spending to no purpose your labor and your wealth, but exposed also to unforeseen dangers from storms or from fire.

I proceed to issue my commands. When these commands reach the said foreign merchants, let them with all haste pay obedience thereto. Let them deliver up to government every particle of the opium on board their store-ships. Let it be ascertained by the hong merchants, who are the parties so delivering it up, and what number of chests is delivered up under each name, and what is the total quantity in catties and taels. Let these particulars be brought together in a clear tabular form, and be presented to government, in order that the opium may all be received in plain conformity thereto, that it may be burnt and destroyed, and that thus the evil may be entirely extirpated. There must not be the smallest atom concealed or withheld.

At the same time let these foreigners give a bond, written jointly in the foreign and Chinese languages, making a declaration of this

effect: 'That their vessels, which shall hereafter resort hither, will never again dare to bring opium with them and that should any be brought, as soon as discovery shall be made of it, the goods shall be forfeited to government, and the parties shall suffer the extreme penalties of the law: and that such punishment will be willingly submitted to.'

I have heard that you foreigners are used to attach great importance to the word 'good-faith.' If then you will really do as I, the high commissioner, have commanded,—will deliver up every particle of the opium that is already here, and will stay altogether its future introduction,—as this will prove also that you are capable of feeling contrition for your offenses, and of entertaining a salutary dread of punishment, the past may yet be left unnoticed. I, the high commissioner, will in that case, in conjunction with the governor and lieut.-governor, address the throne, imploring the great emperor to vouchsafe extraordinary favor, and not alone to remit the punishment of your past errors, but also—as we will further request—to devise some mode of bestowing on you his imperial rewards, as an encouragement of the spirit of contrition and wholesome dread thus manifested by you. After this, you will continue to enjoy the advantages of commercial intercourse; and, as you will not lose the character of being 'good foreigners,' and will be enabled to acquire profits and get wealth by an honest trade, will you not indeed stand in a most honorable position?

If, however, you obstinately adhere to your folly and refuse to awake,—if you think to make up a tale covering over your illicit dealings,—or to set up as a pretext that the opium is brought by foreign seamen, and the foreign merchants have nothing to do with it,—or to pretend craftily that you will carry it back to your countries, or will throw it into the sea,—or to take occasion to go to other provinces in search of a door of consumption,—or to stifle inquiry by delivering up only one or two tenths of the whole quantity; in any of these cases it will be evident that you retain a spirit of contumacy and disobedience, that you uphold vice and will not reform. Then, although it is the maxim of the celestial court to treat with tenderness and great mildness men from afar, yet as it cannot suffer them to indulge in scornful and contemptuous trifling with it, it will become requisite to comprehend you also in the severe course of punishment prescribed by the new law.

On this occasion, I the high commissioner, having come from the capital, have personally received the sacred commands that wher-

## APPENDIX C

614

*Crisis in the Opium Traffic.*

APRIL,

ever a law exists, it is to be fully enforced. And as I have brought these full powers and privileges, enabling me to perform whatever seems to me right,—powers with which those ordinarily given, for inquiring and acting in regard to other matters, are by no means comparable,—so long as the opium traffic remains unexterminated, so long will I delay my return. I swear that I will progress with this matter from its beginning to its ending, and that not a thought of stopping halfway shall for a moment be indulged.

Furthermore, observing the present condition of the popular mind, I find so universal a spirit of indignation aroused, that, should you foreigners remain dead to a sense of contrition and amendment, and continue to make gain your sole object, there will not only be arrayed against you the martial terrors and powerful energies of our naval and military forces;—it will be but necessary to call on the able bodied of the people [the militia or *poese comitatus*], and these alone will be more than adequate to the placing all your lives within my power. Besides, either by the temporary stoppage of your trade, or by the permanent closing of the ports against you, what difficulty can there be in effectually cutting off your intercourse? Our central empire, comprising a territory of many thousands of miles, and possessing in rich abundance all the products of the ground, has no benefit to derive from the purchase of your foreign commodities, and you may therefore well fear, that from the moment such measures are taken, the livelihood of your several nations must come to an end. You, who have traveled so far to conduct your commercial business, how is it that you are not yet alive to the great difference between the condition of vigorous exertion and that of easy repose—the wide distance between the power of the few and the power of the many?

As to those crafty foreigners, who, residing in the foreign factories, have been in the habit of dealing in opium, I, the high commissioner, have early been provided with a list of them by name. At the same time those good foreigners who have not sold opium must also not fail to be distinguished. Such of them as will point out their depraved fellow-foreigners, will compel them to deliver up their opium, and will step forth among the foremost to give the required bonds,—these shall be regarded as the good foreigners. And I, the high commissioner, will at once for their encouragement reward them liberally. It rests with yourselves alone to choose whether you will have weal or woe, honor or disgrace.

I am now about to command the hong merchants to proceed to your factories, to instruct and admonish you. A term of three days is

## DOCUMENTS

1839

*Crisis in the Opium Traffic.*

615

prescribed for an address to be sent in reply to me. And at the same time let your duly attested and faithful bonds be given, waiting for me in conjunction with the governor and lieut.-governor to appoint a time for the opium to be delivered up. Do not indulge in idle expectations, or seek to postpone matters, deferring to repent until its lateness render it ineffectual. A special edict.

Taoukwang, 19th year, 2d month, 4th day. (March 18th, 1839.)  
(True translation.) J. ROBT. MORRISON, Chinese secretary  
and interpreter to the Superintendents of British Trade in China.



## APPENDIX C

### F. LIN'S FIRST LETTER TO THE QUEEN (CR, VOL. 8)<sup>1</sup>

1839.

*Letter to the Queen of England.*

9

**ART. II.** *Letter to the Queen of England from the imperial commissioner and the provincial authorities requiring the interdiction of opium.*

[The paper of which a translation is here given — purporting to be a letter addressed to the Queen of England — was permitted to obtain circulation among the people, in the same manner as many official documents commonly do, about three months since, when the commissioner and governor were about to leave Canton to receive the opium surrendered in the name of the British crown. Presumptive evidence of its authenticity is afforded by the expression on the part of the commissioner of an anxious desire to know how he should convey such a communication to the English sovereign.]

Lin, high imperial commissioner, a director of the Board of War, and governor of the two Hoo, — Tang, a director of the Board of War, and governor of the two Kwang, — and E, a vice-director of the Board of War, and lieutenant-governor of Kwangtung, — conjointly address this communication to the sovereign of the English nation, for the purpose of requiring the interdiction of opium.

That in the ways of heaven no partiality exists, and no sanction is allowed to the injuring of others for the advantage of one's self, — that in men's natural desires there is not any great diversity (for where is he who does not abhor death and seek life?) — these are universally acknowledged principles. And your honorable nation, though beyond the wide ocean, at a distance of twenty thousand miles, acknowledges the same ways of heaven, the same human nature, and has the like perception of the distinctions between life and death, benefit and injury.

Our heavenly court has for its family all that is within the four seas; the great emperor's heaven-like benevolence — there is none whom it does not overshadow: even regions remote, desert, and disconnected, have a part in the general care of life and of wellbeing.

In Kwangtung, since the removal of the interdicts upon maritime communication, there has been a constantly flowing stream of commercial intercourse. The people of the land, and those who come from abroad in foreign ships, have reposed together in the enjoyment of its advantages, for tens of years past, even until this time. And as regards the rhubarb, teas, raw silk, and similar rich and valuable products of China, should foreign nations be deprived of these, they would be without the means of continuing life. So that the heavenly court, by granting, in the oneness of its common benevolence, permission for the sale and exportation thereof, — and that

VOL. VIII NO 1

2

<sup>1</sup> Reprinted from *The Chinese Repository*, Vol. 8, pp. 9-12 (GB).

## DOCUMENTS

10

*Letter to the Queen of England*

MAY,

without stint or grudge,—has indeed extended its favors to the utmost circuit [of the nations], making its heart one with the core of heaven and earth.

But there is a tribe of depraved and barbarous people, who, having manufactured opium for smoking, bring it hither for sale, and seduce and lead astray the simple folk, to the destruction of their persons, and the draining of their resources. Formerly the smokers thereof were few, but of late, from each to other the practice has spread its contagion, and daily do its baneful effects more deeply pervade the central source—its rich, fruitful, and flourishing population. It is not to be denied that the simple folk, inasmuch as they indulge their appetite at the expense of their lives, are indeed themselves the authors of their miseries: and why then should they be pitied? Yet, in the universal empire under the sway of the great and pure dynasty, it is of essential import, for the right direction of men's minds, that their customs and manners should be formed to correctness. How can it be borne that the living souls that dwell within these seas, should be left willfully to take a deadly poison! Hence it is, that those who deal in opium, or who inhale its fumes, within this land, are all now to be subjected to severest punishment, and that a perpetual interdict is to be placed on the practice so extensively prevailing.

We have reflected, that this poisonous article is the clandestine manufacture of artful schemers and depraved people of various tribes under the dominion of your honorable nation. Doubtless, you, the honorable sovereign of that nation, have not commanded the manufacture and sale of it. But amid the various nations there are a few only that make this opium: it is by no means the case that all the nations are herein alike. And we have heard that in your honorable nation, too, the people are not permitted to inhale the drug, and that offenders in this particular expose themselves to sure punishment. It is clearly from a knowledge of its injurious effects on man, that you have directed severe prohibitions against it. But what is the prohibition of its use, in comparison with the prohibition of its being sold—of its being manufactured,—as a means of thoroughly purifying the source?

Though not making use of it one's self, to venture nevertheless on the manufacture and sale of it, and with it to seduce the simple folk of this land, is, to seek one's own livelihood by the exposure of others to death, to seek one's own advantage by other men's injury. And such acts are bitterly abhorrent to the nature of man—arc utterly op-

## APPENDIX C

1839. *From the Commissioner and Provincial Authorities.* 11

posed to the ways of heaven. To the vigorous sway exercised by the celestial court over both the civilized and the barbarous, what difficulty presents itself to hinder the immediate taking of life? But as we contemplate and give substantial being to the fullness and vastness of the sacred intelligence, it befits us to adopt first the course of admonition. And not having as yet sent any communication to your honorable sovereignty,—should severest measures of interdiction be all at once enforced, it might be said, in excuse, that no previous knowledge thereof had been possessed.

We would now, then, concert with your honorable sovereignty means to bring to a perpetual end this opium, so hurtful to mankind: we in this land forbidding the use of it,—and you, in the nations under your dominion, forbidding its manufacture. As regards what has been already made, we would have your honorable nation issue mandates for the collection thereof, that the whole may be cast into the depths of the sea. We would thus prevent the longer existence between these heavens and this earth of any portion of the hurtful thing. Not only then will the people of this land be relieved from its pernicious influence: but the people of your honorable nation too (for as they make, how know we that they do not also smoke it?) will, when the manufacture is indeed forbidden, be likewise relieved from the danger of its use. Will not the result of this be the enjoyment by each of a felicitous condition of peace. For your honorable nation's sense of duty being thus devout, shows a clear apprehension of celestial principles, and the supreme heavens will ward off from you all calamities. It is also in perfect accordance with human nature, and must surely meet the approbation of sages.

Besides all this, the opium being so severely prohibited in this land, that there will be none found to smoke it, should your nation continue its manufacture, it will be discovered after all that no place will afford opportunity for selling it, that no profits will be attainable. Is it not far better to turn and seek other occupation than vainly to labor in the pursuit of a losing employment?

And furthermore, whatever opium can be discovered in this land is entirely committed to the flames, and consumed. If any be again introduced in foreign vessels, it too must be subjected to a like process of destruction. It may well be feared, lest other commodities imported in such vessels should meet a common fate—the gem and the pebble not being distinguished. Under these circumstances, gain being no longer acquirable, and hurt having assumed a visible form, such as desire the injury of others will find that they themselves are the first to be injured

## DOCUMENTS

12

*Crisis in the Opium Traffic.*

MAY,

The powerful instrumentality whereby the celestial court holds in subjection all nations is truly divine and awe-inspiring beyond the power of computation. Let it not be said that early warning of this has not been given.

When your majesty receives this document, let us have a speedy communication in reply, advertizing us of the measures you adopt for the entire cutting off of the opium in every seaport. Do not, by any means, by false embellishments evade or procrastinate. Earnestly reflect hereon. Earnestly observe these things.

Taoukwang, 19th year, 2d month, —— day. Communication sent to the sovereign of the English nation.

---

## APPENDIX C

### G. LIN'S FIRST MEMORIAL FROM ZHENKOU (KUO)

Lin's account of what happened to the opium is contained in two memorials to the emperor which have been translated into English and published in P. C. Kuo's A Critical Study of the First Anglo-Chinese War with Documents, specifically documents number 15 and 16, pages 243-250.

#### DOCUMENT NO. 15

*C. P. Y. W. S. M. (T. K.), 7/6-9*

#### COMMISSIONER LIN REPORTS THAT NEARLY HALF OF THE OPIUM HAS BEEN DESTROYED

*(Memorial of Lin Tse-hsü, Imperial Commissioner and Governor-General of Liang-Kiang; Teng Ting-chen, Governor-General of Liang-Kwang; and Iliang, Governor of Kwangtung. July 8, 1839)*

Upon a previous occasion, I, your minister, and others had the honor of petitioning to send the original chests of opium surrendered by the barbarian vessels to Peking, in regard to which your Imperial Edict of the twelfth day of the fourth month [May 24, 1839] had given full approval. While we were taking steps towards shipping the said opium, we received another dispatch from the Privy Council which is of this tenor: the Imperial Cabinet had received your Royal Order that although our petition had been approved, yet as the Censor Teng Ying had pointed out that Canton is at a great distance from the Capital and that close inspection against fraud in the transporting of the enormous amount of opium is well-nigh impossible, and considering that we have carried on the persecution of opium with great rigor and honesty and also that the proposed transportation would involve the expenditure of much labor on the part of the people, it was finally decided that the transportation of the opium to Peking was to be abandoned and that we, Lin Tse-hsü, Teng Ting-chen, and Iliang, upon the completion of the surrender of the opium, should coöperate with civil and military officers to effect a total destruction of the drug so that the inhabitants of the coastal regions and the barbarian residents in Canton would fully learn the situation with consternation, only on condition that we inspect closely and guard against any fraud that might be done by the officers concerned.

As we ponder on the fact that your Majesty, in carefully devising the means of abolishing evils, also tenderly considers the life and labor of the people, we read the Order, kneeling and unable to express our sense of respect and admiration. We believe that in destroying the opium, possible abuses are abundant. There is an imperative need of close watch in order to prevent

## DOCUMENTS

frauds. The reason is that this drug has been prevalent for a long time and that wherever there is occasion to profit from it the multitude always hasten to seek a share in it. Formerly, in the seventeenth year of Taokwang [1837], I, Teng Ting-chen, had memorialized your Majesty about the lawless persons purchasing opium from the barbarian ships. It was purchased formerly at more than thirty Spanish dollars a piece. Now, the same is sold for sixteen or eighteen dollars. But even if we count the value at the current price, each chest is worth more than \$600; and the total worth of the 20,000 odd chests is no less than 10,000,000 odd dollars. Indeed, those who are righteous and law-abiding would not only abandon this with disdain but also look at it as great poison. But those who have been in the habit of smoking it, on the contrary, would be greatly tempted by it; and those who are dealers in it would seize this opportunity to promote their interests. Should there be any laxity in inspection, a great number of frauds would arise therefrom.

Since we, your ministers, had received the surrendered opium, we considered it of supreme importance to guard against the possible plots of lawless persons, as the Bogue is very near to the seacoast. We therefore first set out to find a proper place for storing the opium. As each chest is about three feet long and half that in both height and width, a large house can accommodate only about four or five hundred chests. Further, the people's houses and temples in that locality [Chuenpi, on the Bogue] are all small and we found it necessary to put several buildings together, encircling them with a fence and covering them with a high roof. The chests of opium were thereupon evenly divided, stored, and sealed in the several places. Inside the roofs, twelve officers, chief and assistant, were ordered to guard the stores. Outside, ten military officers with a garrison of one hundred watched day and night. Fortunately they kept their office without any laxity.

As to the method of destroying the opium, we had also deliberated and experimented for a long time. The traditional practice of burning the drug, with wutung-oil mingled with it, is indeed a good method. But we learned that after the burning, there was always much residue remaining on the ground which experienced purifiers of opium could easily dig out and gain twenty or thirty per cent. By so doing, therefore, the evil still cannot be brought to an end. After extensive inquiry and consultation, we came to learn that there are two things which are the deadly enemies of opium - salt and lime. It is observed by the purifiers of opium that when mixed with salt and lime in the process of purification, the opium will never yield the oily paste desired. Therefore, the antagonistic tendencies of opium and these two things ought to be utilized for the purpose of abolishing the evil. But if the numerous chests are to be destroyed thus by salt and lime one by one, then tens of thousands of pans should be established; and in that case, a thorough

## APPENDIX C

supervision would be most difficult. If a small number of them are established, then it would take several months to complete the work of destruction. We conferred with one another again and again and finally resolved that on the seashore two ponds be dug out to be used alternately for the purpose of destroying the said opium. Each of the ponds has a flat, stone-paved bottom, more than 150 feet each in length and width, with boards on the four walls preventing the outlet of the melted drug. In front of the pond there is an exit to the sea; and in the rear an aqueduct. On the banks of the ponds there are fences which embrace seats for officers of inspection. As to the process of destruction, water is first conveyed into the ponds through the aqueduct; then salt is made to dissolve in the water; the opium, each piece broken into four parts, is thereupon thrown into the salt water to stay there for half a day; and finally whole pieces of thoroughly heated limes are thrown into the mixture. It instantly boils, burning by itself. Meantime, a number of laborers are hired to stir inside the pond with their plows so that every particle of the drug shall be melted away. At the time of the receding tide, the front exit is opened to let out the melted matter, and clean water is introduced to wash the bottom of the pond so that not an iota would be suffered to stay. If the one pond cannot be cleaned on day A, then the other would be used on day B. The same process of dissolving, mixing, melting, and stirring is followed. Only by so doing - cleaning the bottom of a pond whenever using it - is it possible to prevent cheating or abuse. At the end of the day, when the work is to be stopped, the fences of the four banks of the ponds are completely locked and civil and military officers are stationed there to guard it.

As eastern Kwangtung is very warm, the laborers hired frequently wear only short trousers, with nothing on the breast or on the feet. In addition, at the time when they leave the spot at the end of a day's work, they are searched and nothing is suffered to be carried out. At the beginning of the process, only three or four hundred chests were destroyed a day. But the methods improved with the lapse of a few days. At present, from 800 to 1,000 chests are destroyed every day. At the time of dissolving, the thick oily part floats on the surface, while the siftings sink down. A peculiarly repugnant smell comes out from it, making people seek to avoid the ponds. We thereupon realize that it must be due to a particular manipulation in the preparation of the drug, different from the ordinary method of deriving it from the poppy as commonly known, that this drug can stupefy men's spirits, shorten their lives, and distort their physical shape.

At the time of the destruction of the opium, the inhabitants of the coastal regions gathered around to see the operation in great numbers. But they were kept outside the fences and never were they allowed to step in, so that all possible frauds could thereby be avoided. The barbarians going up to Canton

## DOCUMENTS

or down to Macao that passed by the spot only gazed at the place from a distance and never tarried long or in any assailing manner. Judged by their manners, it appears that they feel a sense of shame. It is all due to the Virtue of your Holy Majesty which makes both the foreigners and the natives know how to fear and obey. Henceforth, it seems that all will reform themselves and be greatly improved.

There are different kinds of opium. The black opium is called *Kung pan tou* [Patna], said to be the best. Next to it is *Pak tou* [Malwa]. Still inferior is *Chin hwa tou* [Persian]. When the chests of opium were broken and destroyed this time, we accordingly assorted the different kinds, numbered them, and entered them into registers. Generally speaking, *Kung pak tou* and *Pak tou* form the major part, while *Chin hwa tou* is less than one per cent. All the chests have now been weighed and those contained in bags have also been reduced to the net weight of the chests. During the period extending from the twenty-second day of the fourth month [June 3, 1839] to the third day of the fifth month [June 13], 8,320 chests and 2,119 bags had been melted and destroyed, weighing totally 1,128,729 catties. Compared with the grand total, nearly a half has been destroyed. We are now carrying on the work of destruction with speed, daring neither to execute the task in a hasty manner nor to suffer it to proceed slowly.

As we are aware that the matter might concern your Holy mind, we respectfully submit this united memorial to report the steps taken up to the present and beg your Imperial perusal thereof.<sup>1</sup>

---

<sup>1</sup> Kuo, P. C. *A Critical Study of the First Anglo-Chinese War with Documents*. Taipei: Ch'eng Wen Publishing Co., 1970, pp. 243-247. Originally published in Shanghai in 1935.



## APPENDIX C

### H. KING'S ACCOUNT (LONDON *TIMES*, 1 NOVEMBER 1839)

This version of King's account comes from the London *Times*, 1 Nov 1839.

#### IMPERIAL EDICT RESPECTING THE SURRENDERED OPIUM, THE PROCESS OF DESTROYING IT, &C.

(Extracts from Letters of C. W. King, Esq., of Canton, to J. Ballestier, Esq.)

"For some days past the following edict or 'Ko-she' has been posted up at Macao, after the Chinese fashion of making known official matters to the populace: -

"Lin, Imperial Commissioner, &c., at present appointed to regulate the naval and military affairs of Kwang-tung; Tang, a director of the Board of War, &c., Governor-General of Kwang-tung Kwan-se, and E , a member of the Board of War, &c. ; conjointly issue this proclamation, to evince their obedience to the Imperial command - that the opium surrendered by the store ships be destroyed at Canton.

"Inasmuch as the foreign ships had delivered to us opium to the amount of 20,291 chests, we reported the same to the Emperor, and on the 17th day 4th moon (29th of May) we received the imperial reply as follows :-

"The report of Lin and his colleagues states that the receiving-ships have delivered up the whole of their opium, and prays that the same may be sent to the capital, in proof of their report, and there to be destroyed. We know that the settlement of the opium affairs has on this occasion been faithfully performed. We have no suspicion of any concealment or evasion of duty. Moreover, the transportation of the opium to so great a distance would draw heavily on the people's strength. It is inexpedient, therefore, to send the opium to the capital; and we commit it to Lin and his associates (when the surrender is completed) to assemble the local officers, civil and military, and to cause it to be destroyed in their presence. Thus will the people of the sea-side and the foreigners at Canton be made to see and tremble. Respect and Obey.

"Now, on the 22nd of the 4th moon (3d of June) we assembled the civil and military officers of the district at *Hoomun* (the Bogue), and caused vats or trenches of stone to be prepared, in which to dissolve the opium with *lime and salt*, and whence it might be conveyed into the sea, that no traces of it might remain. To make this known, we issue a special proclamation, commanding the people of the sea-side to acquaint themselves therewith, that they may henceforth respect the majesty and observe the commands of the Emperor. They must know that *an article so destructive is unfit to be used even for manuring the ground*. Let it never again be clandestinely brought here for

## DOCUMENTS

sale, for all such attempts must lead to loss of life and property. A special proclamation.

"Taoukang; 19th year, 4th moon, 24th day (5th June)."

"The sight of this proclamation confirmed me in my previous intention, to proceed to the Bogue, on the first arrival of a ship to my consignment, to witness the process of destroying the opium, and to seek a conference with the commissioner, respecting the existing and the apprehended difficulties. The Morrison coming in on the 14th, I proceeded in her the following day to the Bogue, with two friends, and on anchoring at noon, the 17th, sent a card to one of the naval officers of the Chuenpee station, asking the necessary permission. The card was duly conveyed to the commissioner, and the request promptly granted. At 10 a. m. (the 17th) we left the ship in our own boat, escorted by several barges, and proceeding up the channel east of the Bogue forts, some five or six miles, reached at 11 the spot where the drug is being destroyed, and where the commissioner has his temporary residence. We found the spot to be an enclosure of some 400 feet square, well palisaded, the side opposite (away from) the river being occupied by neat buildings, for storing the opium, and etc. The larger part of the fore ground was covered by three vats of perhaps 75 feet by 150 each, opening by sluices into the river. The chests of opium, after being reweighed, and broken up in the presence of high officers, were brought down to the vats; the contents, ball after ball, broken down and crushed upon platforms, raised on high benches above the water, and then pushed by the feet of the Coolies into the receptacles beneath. A large number of men were employed in thus mascerating the balls for some days with long rakes, until the whole had become a fetid mud, when the sluices were raised, and the vats emptied into the river. Every precaution seemed to be used by the officers to insure the complete destruction of the drug, the spot being well-guarded, the workmen ticketed, and etc. In fact, we turned from the scene, fully satisfied that the work was being performed with rigid faithfulness, and much disposed to wonder, that while Christian Governments are growing and farming this deleterious drug, this Pagan monarch should nobly disdain to enrich his treasury with a sale that could not fall short of 20,000,000 Spanish dollars.

"Have we anywhere on record a finer rebuke administered by Pagan integrity to Christian degeneracy?

"We now passed to our audience with the commissioner through piles of broken opium boxes and coverings, the latter still bearing in full relief a mark well known to the Chinese throughout the empire - the mark of the Hon. East India Company. We found his Excellency in a temporary audience-room; supported on the right by the Admiral of the station, and on the left by the Hoppoo and the provincial judge, or Anchetse. We stood before the

## APPENDIX C

commissioner, but were permitted and requested to follow our own fashion as to ceremonies. His manner was kind and simple, and his fine, vivacious, and spirited countenance contrasted favourably with that of the square, hardfeatured Admiral, and of his heavy, unintelligent colleagues on the bench opposite.

"After replying to his questions, if I had duly received his chop (addressed to me in March last), if I had seen the process of destroying the drug, and etc., my two petitions were presented. Unhappily I had relied on his having, as report said, an English translator with him, and had neglected to prepare a Chinese copy. He received the papers, and replied to the first, (which respected the concerns of the Morrison), that my business should go on without interruption, on the old footing. The second was a long paper, requesting certain ameliorations, and etc., calculated to remove the existing difficulties, and to avert the threatened hostilities. Our imperfect power of communicating (through the Canton dialect) did not allow us to discuss the petition article by article, and the conference turned chiefly on the approach of hostilities. He assured us, that whatever might be the course pursued by England, the legal traders of other nations should be carefully protected. We intimated that the Chinese power of protection did not extend beyond their own shores, but this, though fully admitted by our middle-men, was probably not stated to his Excellence. Many general questions and replies followed, and on leaving it was arranged that an answer to the petitions should be given on the Morrison's return to Chuenpee, after obtaining her pilot. We regained the ship at 1/2 4 o'clock p. m., and were followed by the usual presents of provisions, &c. After weighing anchor my petitions were brought off, with the report that the commissioner's attendants were unable to translate them, and it was further agreed that that office should be done by ourselves on the way to Macao, and the copies again sent up by the Morrison.

"It is highly probable that the commissioner, having unbent for a moment to a private foreigner, will fall back upon his rank, and guard with the usual care the avenues of petition. I see no reason, however, why any well-disposed foreigner may not satisfy himself, if he have any doubt left as to the destruction of the opium. Having long ago staked my judgment on the side of the sincerity of the Imperial Government, as to the suppression of the traffic, I am not disappointed at a scene which others have ridiculed in prospect, but which I have now witnessed. Whatever may have been the blunders of the commissioner in the detail of the confiscation, the Imperial Government is, and I believe has ever been, actuated by an honest aversion to the traffic, and a benevolent desire to suppress it. It has no hostility to the legal trade with western nations. On the contrary, the increasing magnitude of that commerce is yearly giving it a firmer hold on the interests of the people

## DOCUMENTS

and the policy of the empire. Had those western states been as true in their treatment of the drug in its beginnings as this has been in its endings the late catastrophe would have been averted. It is solely to the low state of commercial and political morality - to the system, which gives up the vices of the people to be preyed upon by public and private avarice - that we owe this sudden wreck of property, and this almost indelible stain upon the European character."<sup>1</sup>

---

<sup>1</sup> King, Charles W. "Imperial Edict respecting the Surrendered Opium, the Process of Destroying it, and etc. (Extracts from Letters of C. W. King, Esq. of Canton to J. Ballestier, Esq.)," *The London Times*, 1 November 1839, Issue 17188, column C, p. 2, found at [http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2\\_TTDA\\_2\\_\\_11/1/1839\\_\\_](http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2_TTDA_2__11/1/1839__).

## APPENDIX C

### I. BRIDGMAN'S ACCOUNT (*CR*, VOLUME 8, 1839-1840)

Bridgman's account is available online at GoogleBooks in volume eight of the *Chinese Repository*, pp. 70-77. Be careful of the indexing at GB. Sometimes the volumes are mismarked. Check the title page of each volume. It is, or rather was, available online through [www.macaudata.com](http://www.macaudata.com), since blocked and labelled "under construction." Unfortunately, pages 70, 71, and 72 which describe Bridgman's journey from Chuenpi to Chunhow were overlaid with previous pages from the same volume, the only mistake in the book, an incredible coincidence. The same volume is also available from Elibron Classics but only a limited preview is possible, which will try to deny access to the complete account. Typing in a series of keywords will bring up the missing pages, for example, "Loo," or "Chinkow," or "legitimate trade."

No. 50.

#### *Destruction of the opium at Chunhow (Chinkow).*

On the afternoon of the 15th instant, at the request of Mr. King, I embarked with him from Macao, in the ship Morrison, captain Benson, and proceeded up the river to Chuenpe. Mr. K.'s object was twofold: first to witness the destruction of the opium, then going on in that neighborhood; and in the second place, to make inquiries respecting the conditions, on which ships may hereafter enter the Bogue. Since many had declared that the Chinese would not destroy one catty of the drug, and many others had expressed their belief that, should the destruction be actually undertaken, great quantities would be purloined; it seemed the more desirable that some foreigners should obtain admittance to the place where the drug was actually being destroyed.

The opportunity, therefore, of being an eye-witness of a scene so novel, was gladly improved, with the determination to make every practicable inquiry and observation, respecting the fidelity of the work as it went on under the immediate inspection of the high commissioner. Contrary to our expectations, no obstacles were opposed to our wishes; and I have only to regret, that others could not have availed themselves of a like opportunity to witness the same scene. That liberty to do this should be given, seems evidently to have been intended by the emperor's own mandate, in which he commands, that the opium should be destroyed in Canton, where natives and foreigners 'both alike might hear of it, and see it.'

## DOCUMENTS

About noon, on the 16th, the Morrison anchored at Chuenpe, near the station where the deliveries were made from the receiving ships, perhaps two miles below the fort on Anunghoy, and less than one fourth that distance from the guns on Chuenpe, and those in the war-junks in Anson's bay. In the course of the afternoon, a card and an open note, stating the object of the visit, were put into the hands of the chief naval officer on the station, who after some demurring, saying the request ought to have been made at Macao, &c., promised to send off both by express to the commissioner, and to return an answer before noon, next day. A pilot, who came off from the fleet at sunrise the following morning, to make inquiries about the Morrison, said a favorable answer would be given; and his report seemed to be confirmed by the unusual display of flags on board the junks, and by the appearance of several large barges in the fleet.

At half-past nine o'clock, a. m. one of the large boats came alongside, having on board Loo Taeyue, a naval officer of the rank of captain. He was immediately received on board, and conducted into the cabin. After being seated, and passing compliments, he said he had been directed by the high commissioner, and the admiral his master, to convey in person their pleasure that Mr. K. should proceed to Chunhow. He asked whether the party would prefer to go in his barge, or in the captain's gig; and remarked that it was unnecessary for us to take any arms, as we should be escorted by several boats, and faithfully protected and conducted back by himself. He further very politely - and very gallantly too for a son of Han - inquired if Mrs. King would like to join the party.

While our boat was being made ready, Loo improved the opportunity to give us some account of his valiant self and of the imperial navy, and made sundry inquiries about admiral Maitland, whom he had the pleasure of seeing some months back. He inquired particularly for Mr. Morrison, who acted as interpreter on that occasion; and wished to know if the English superintendents, Elliot and Johnston, were both at Macao. He did his best to make himself agreeable to us, and was throughout the day attentive and lavish of compliments. He admired the ship and crew, and did not fail to mark the contrast between them and his own.

At 10 o'clock, we left the Morrison, our party consisting of Mr. and Mrs. King, captain Benson, myself, and six seamen. Loo, in his own boat, manned with about sixty seamen, with a few attendants, led the way, and our gig followed. As we passed though [sic] the fleet, several other boats, with officers on board, joined the party, some under sail, and others with rowers - all in high spirits and full of glee. When east of Anson's bay, having a little islet on our right, and the ruins of an old fort on the left, we passed through Sankow (the *three mouths* of the creek), and over Shakeo (sandy point), and with fair

## APPENDIX C

wind and tide reached Chunhow, in less than an hour from the time of leaving the ship. Chunhow is, I should think, five or six miles from the fort on Chuenpei; and nearly due east, distant about two miles from the fort on Anunghoy. From the islet above mentioned, our course was northeast up a small creek, with hills and dales, ricefields and rivulets, on each side. A few thatched huts were seen here and there, with two or three small villages off to the southeast. In the opposite direction, near the banks of the creek, there was a military station, a mere watch-house, and a large ancestral temple. A good many boats were passing and repassing the river, exhibiting on all sides the aspect of quiet and industry.

Chunhow is a long narrow village, on the east side of the creek, running north and south, perhaps one third of a mile. The site selected for the deposit and destruction of the opium, is on the bank of the creek, at the brow of a hill, a short distance from the north end of the village, including an area about 400 or 500 feet square, strongly empaled with bamboos. Crowds of spectators appeared in the boats, on the houses, and on the sides of the hill, as our party passed by the village. As we approached the landing-place, the war-boats and junks beat a salute; and two divisions of troops, in full uniform, were drawn up under their respective standards, one on the south, the other on the north, of the enclosure. It was a fine morning, and the Chinese seemed delighted with the arrival of our little gig. The scene around us, taking it all in all, was pleasing and somewhat imposing; still there was something in the work itself which made me feel sad and sick at heart.

Just before reaching the landing-place, Loo, our guide, asked whether we would see the commissioner. Being answered in the affirmative, he inquired what ceremonies we would perform, and whether we would make the *kotow* or not. Refusing to perform the latter, and intimating what would be our pleasure, it was agreed at once, that we should conform to the usages of our own country.

Loo, stepping on shore before us, begged us to wait till he could announce our arrival, and make arrangements for reception. After a short absence, he returned attended by a military officer, named Wongchin, deputed by the commissioner to wait on the visitors. He wore a long heavy cutlas, and was booted and belted like a warrior. He was a Mohammedan, a native of one of the northern provinces; rather tall, stout, of a very dark complexion, wearing a thick long black beard. He had evidently been bred in the camp, and inured to a martial life. As he and Loo approached our gig, the latter pointed out each of us, calling us by name; and then requested me to step on shore. After a formal introduction to his friend Wongchin, Loo stated the arrangements that had been made for the occasion: we were first to examine the whole works in detail, and afterwards were to have an audience with the commissioner, if we

## DOCUMENTS

desired it. Also it was intimated, that we should choose our own time, and inspect every part as long and as minutely as we wished.

Our party now stepped from the gig, and passing along a pier, entered the enclosure. This, as described above, was a large area, surrounded by a strong palisade, like a Malayan camp. There were gates on each side, excepting the east; at these, sentinels were stationed, and no person was allowed to enter without a ticket. And on going out of the place, every one was examined. The number of workmen was said to be about five hundred. The number of officers, civil and military, could not have been less than sixty or eighty. A collection of finer looking men I have scarcely ever seen. Many of the clerks and attendants, too, were young and good-looking. All these officers were employed as inspectors and overseers. A part of them were on elevated seats, under mat sheds, to watch all the movements, in every part of the enclosure; and their position was such that nothing could escape their notice. By alternation, some of these were kept always at their posts, day and night. Another part of the officers superintended the delivery of the opium from the chests, which had been stored up in small enclosures within the large one. Special care was taken to see if each chest and parcel now corresponded to what it was marked down, when taken from the store-ships.

On the west side of the enclosure, just within the palisades, were three large vats or trenches, running from east to west, say 150 feet long, 75 feet broad, and 7 deep, flagged with stone, and lined along the sides with heavy timbers. Each of these three had its own fence, with entrances only on one side. When we were there, one had no opium in it; a second was being filled; and another was nearly ready to be emptied.

The process to which the drug was subjected, was briefly this. In the first place, a trench was filled two feet deep, more or less, with fresh water, from the brow of the hill. The first trench was in this state, having just been filled with fresh water. Over the second, in which the people were at work, forms, with planks on them, were arranged a few feet apart. The opium in baskets was delivered into the hands of coolies, who going on the planks carried it to every part of the trench. The balls were then taken out one by one, and thrown down on the planks, stamped on with the heel till broken in pieces, and then kicked into the water. At the same time, other coolies were employed in the trenches, with hoes and broad spatulas, busily engaged in beating and turning up the opium from the bottom of the vat. Other coolies were employed in bringing salt and lime, and spreading them profusely over the whole surface of the trench. The third was about half-filled, standing like a distiller's vat, not in a state of active fermentation, but of slow decomposition, and was nearly ready to be drawn off. This was to be done through a narrow sluice, opened between the trench and the creek. This sluice



## APPENDIX C

was two feet wide, and somewhat deeper than the floor of the trench. It was furnished with a screen, made fine like a sieve, so as to prevent any large masses of the drug from finding their way into the creek. Loo told us that the destruction of the opium, which commenced on the 3d, would be completed by the 23d. At first, he said, less than 1000 chests per day were worked off; but the day we were there he thought the number would be nearly 1300 chests.

By half-past 11 o'clock, we had examined and reexamined every part of the process of destruction. The degree of care and fidelity, with which the whole work was conducted, far exceeded our expectations; and I cannot conceive how any business could be more faithfully executed. The watch was apparently much stricter, on every side, than it was during the detention of foreigners in Canton. One poor man, at Chunhow, for only attempting to carry off some small pieces of opium about his person, was, on detection, almost instantly visited with the extreme penalty of the law. If any was pilfered, it must have been in very small quantities, and at the most imminent hazard of life; at least, so I am constrained to believe.

Well satisfied with the inspection of the trenches, we were again asked if we were ready to see the commissioner. A seat for Mrs. K. was provided near the boat in one of the watch-houses, where she was furnished with tea and sweetmeats, attended by captain Benson, while Mr. King and myself, conducted by Loo and Wongchin, proceeded to the east side of the enclosure, to the apartments of the commissioner. These were large and commodious, built of bamboos, like the temporary theatres of the Chinese. The hall of audience was about twenty feet square, a little elevated, and open on the west side, so as to command a full view of the trenches and landing-place. The floor was covered with carpets, and the walls decorated with scrolls. When within a few yards of the hall, Loo pointed out to us one by one, the officers we were going to meet. Lin, his majesty's high commissioner, occupied the east side of the hall alone, seated in a broad chair or sofa, with two tables near him, one on each side. The admiral, or commander-in-chief, of the maritime forces of the province, occupied a seat alone at the commissioner's right, on the north side of the hall; at his left, on the south side of the hall, the hoppo and commissioner of justice, or *nganchasze*, were seated. All the other officers were standing, some within and others without the hall, habited in their summer dresses, wearing silken boots, and light straw hats or bonnets, crowned with buttons indicative of their respective rank.

When leaving Macao, we had little expectation of being so soon ushered into the presence of such dignitaries as those now before us. However, we determined to take full advantage of Chinese moderation, and to protract our interview so as to see and to learn whatever the occasion would allow. With a suitable air of indifference, and all due gravity, *à la Chinoise*, we advanced to

## DOCUMENTS

the west side of the hall. Here we took off our hats, and bowed to the commissioner, standing directly before him, surrounded by a dense crowd of officers and attendants. Loo and Wongchin, at the same time, in the middle of the hall, kneeled and prostrated themselves before his excellency, who immediately bade them rise; and the conference commenced, and lasted full two hours. Loo and Wongchin were chief speakers, first addressing the commissioner, and then communicating with us.

The commissioner opened the conversation by inquiring if Mr. K. had recieved his communication, addressed to him, sometime back, while in Canton. In replying to this, reference was made to the inconveniences and losses sustained by the late proceedings; and it was inquired, whether any security would be given that such should not occur in future. This prepared the way to ask for a specification of the conditions on which ships will henceforth be allowed to enter the port. His excellency said, the evils had grown gradually and secretly, because their authors had been dealt with so leniently; and that now the time had come when forbearance was no longer possible. It was solely for the suppression of the traffic in opium that the late severe measures had been prosecuted. The illicit trade, he said, must now be stopped; the other should be protected. After speaking long and animatedly on this point, the commissioner gave the following in writing.

"Vessels engaging in the regular and honorable trade, and really having no connection with the hurtful practice of introducing opium, shall assuredly receive additional favor, and shall in no way be involved in difficulties.

"Vessels engaging in the clandestine sale of opium, shall assuredly be examined and treated with great severity, and no degree of favor or leniency shall be shown to them.

"In brief, the good are good for themselves, and the evil are evil for themselves. Let the good, dismissing all anxiety of heart, prosecute their commerce freely, without any apprehensions of difficulty. As for those who are evil, it only remains that they early turn about, change their practices, and abandon their vain expectations."

In the course of the conversation, Mr. K. presented two papers to the commissioner, one referring to his own vessels, asking that they might enter and trade as formerly. This, the commissioner said, should be granted. In the second paper, after alluding to the unhappy and dangerous position in which affairs have been recently placed, it was urged, that speedy reparation ought to be made for all losses that had been unjustly incurred, that ample security should be given that the like interruption of the regular trade should not again occur, and that it should be clearly proclaimed that it was only against the traffic in opium that severity is to be exercised. With a view to remove existing evils, to guard against their recurrence, to preserve peace, and to

## APPENDIX C

extend commerce, it was further suggested, that the port-charges should be fixed according to the amount of goods; that three additional ports, northward, should be opened to all foreigners; that merchants should be allowed to have their families reside with them; that in all criminal cases, the offender should be tried by his own consul, acting jointly with the local commissioner of justice; that ministers plenipotentiary should be allowed to reside in the capital, near the emperor, &c.

Very particular inquiries were made respecting the intentions of the English in withdrawing from the port, and also as to the best mode of conveying communications to the queen of England and other European sovereigns, in order to secure their coöperation for the suppression of the traffic in opium. Inquiries were made for maps, geographies, and other foreign books; and particularly for a complete copy of Morrison's Dictionary.

From the whole drift of the conversation and inquiries during the interview, it seemed very evident that the sole object of the commissioner was, and is, to do away the traffic in opium, and to protect and preserve that which is legitimate and honorable. Both in the manner and matter of his conversation, he appeared well; betraying, indeed, now and then, more or less of that partiality for his own country and sovereign, and that disregard of all others, which are so characteristic of great statesmen. Throughout, he was bland and vivacious, and exhibited nothing that was "barbarous or savage." He appeared to be not more than 45 years of age; is short, rather stout; has a smooth, full round face, a slender black beard, and a keen dark eye. His voice was clear, and his tones distinct. His countenance indicated a mind habituated to care and thoughtfulness. Once only he smiled - almost laughed, - as Mr. K. declined to characterize the members of the cohong. The question was, who of them were good? It was not answered. The accounts given him of British naval power - especially of steam vessels - seemed rather unpalatable, and once or twice raised a frown on his brow.

After taking leave of the commissioner, we were conducted back in the same manner as we came up. A large collection of presents were sent after us. At five p. m., we were on our way to Macao. About nine o'clock in the evening, our old friend Loo came down to us, to return the papers for translation, they having been presented in English, and the commissioner's linguists being unable to understand them. A translation was promised to be soon ready, and he again took leave. The next day at sunset we reached Macao, well pleased with the trip.

P. S. The commissioner has in his service four natives, all of whom have made some progress in the English tongue. The first is a young man, educated at Penang and Malacca, and for several years employed by the Chinese government at Peking. The second is an old man, educated at

## DOCUMENTS

Serampore. The third is a young man who was once at the school at Cornwall, Conn., U. S. A. The fourth is a young lad, educated in China, who is able to read and translate papers on common subjects, with much ease, correctness, and facility.<sup>1</sup>

---

<sup>1</sup> Bridgman, Elijah C. "Destruction of the opium at Chunhow (Chinkow)," *The Chinese Repository*, volume eight, pp. 70-77 (GB).

## APPENDIX C

### J. LIN'S SECOND MEMORIAL FROM ZHENKOU (KUO)

DOCUMENT NO. 16

*C. P. Y. W. S. M. (T. K.), 7/18-20*

#### THE COMPLETION OF THE DESTRUCTION OF THE OPIUM

*(Memorial of Lin Tse-hsü, Imperial Commissioner and Governor-General of Liang-Kiang; Teng Ting-chen, Governor-General of Liang-Kwang; and Iliang, Governor of Kwangtung. July 28, 1839)*

We, your ministers, in conformity with your Imperial edict, had begun the destruction of the twenty thousand odd chests of opium surrendered by the barbarian vessels in Canton. In regard to the prevention of frauds and the results of inspection with civil and military officials, we had on the third day of the fifth month [June 13, 1839], when nearly half of the drug had been destroyed, made a memorial reporting the proceedings to your Majesty.

Since that time we have followed the same method of first breaking the chests, then weighing the opium, then cutting it into pieces, and finally throwing it into the pond to be mixed with salt water and dissolved by lime. In all, we wait till all has been thoroughly destroyed and then sent to the sea at the time of the receding tide. We, heading a train of civil and military officers, went to the spot day by day for the purpose of inspection. There were not lacking people who endeavored to steal the opium; but as a great number of officers were supervising the work, more than ten of these people had been arrested on the spot. These were instantly subjected to severe penalties. Also, there were thieves and robbers who in the night broke through the walls of the storehouses and through the chests inside to steal the opium. These had also been caught by the garrison and are now on trial and are going to be heavily punished.

From afar as well as from the immediate vicinity the people came to look at the destruction. The number of spectators was particularly great at the time of the Dragon Festival; [footnote 1, page 248 by P. C. Kuo appears at this point: Annual festival in China on the fifth day of the fifth month. In the present case, it came on June 15, 1839. - The Transl.] they all gazed in consternation. And also the American merchants, King, Bridgman, and others, together with their families, came by sampan from Macao and asked permission to the spectacle from Yan Yin-ko, Commander of the Naval Cruisers. Considering that a previous edict by your Majesty had permitted the barbarians resident in Canton to understand the situation fully so that fear would arise in their minds, we had upon a former occasion made a public proclamation to that effect. The coming of the American barbarians at present is in accordance with that proclamation. And as we examine into the conduct of King and other barbarian merchants, we are fully convinced that they

## DOCUMENTS

always traded righteously and never dealt in opium. Therefore we sent officers to escort them to the ponds and let them fully acquaint themselves with the methods of cutting opium, dissolving, melting, and destroying it. The said barbarians all nodded heads at the spectacle and also constantly covered their noses with their hands against the smell. They finally came to us, taking off hats and shaking hands with us as if expressing their willingness of submission. Thereupon we accordingly ordered the interpreters to notify the said barbarians that the new regulations prohibiting opium of our Imperial government are exceedingly strict - so strict that not only those who always abstain from the contraband trade should not bring in any, but they should also inform the barbarian peoples of various nations about it, persuading them to seek proper trade whereby infinite profits would be derived and to avoid contraband trade and consequent prosecution by law. The said barbarians listened to us with great attention and their heads dropped downward apparently fully convinced by what we said to them. Then we gave them food to eat whereupon they left the spot in great cheer and respect.

In our previous memorial we have represented that the opium is of three kinds - *Kung pan*, *Pak tou*, and *Chin hwa*. We however have found later when breaking the original chests still another kind, namely, small *Kung pan*. Of the latter species a chest can contain eighty pieces which are smaller in shape than the usual *Kung pan*. The number of pieces in a chest is thus doubled, but the weight is the same. Each piece is wrapped up with linen and it represents also a superior workmanship. We are informed that this is the best species in foreign countries and costs very much. So the opium now destroyed consists of four different kinds.

Lately, we have been reading with great respect in our temporary abodes the Imperial Edict warning against cheating in the surrendering of opium and smoking instruments. This reminds us of your Imperial intention to cause a thorough and honest prohibition of opium. But, as we see it, in order to decipher what is false, it is most important to know what the true is like. We do not know what is the opium seized in different localities lately. If we can compare it with the opium contained in the original chests, then the true and the false can be instantly differentiated. Hence we have preserved two chests of each of the four kinds aforesaid, which we intend to keep as samples. If your Majesty thinks fit to ship them to Peking, we shall promptly do so, and the transportation would not involve any great expenditure of labor. If it is unnecessary, then it can be destroyed together with the opium seized every month in different localities in eastern Kwangtung.

Besides the said eight chests which are to be kept temporarily, the amount of opium destroyed, including the amount represented in a previous memorial, is 19,179 chests and 2,119 bags. The net weight of the opium, not

## APPENDIX C

counting that of the chests and bags, is 2,376,254 catties, all of which were destroyed by the fifteenth day of the fifth month [June 25, 1839]. At present the dirty thing having been swept away, a great evil is prevented from spreading into the country. In future, the task of prohibition will depend upon a rigid law. Only by so doing can the spirit of benevolence of your Majesty be fully conformed to.

The foregoing is a true account of the completion of the destruction of the opium presented by us [Lin Tse-hsü, Teng Ting-chen, and Iliang] together with Kuan T'ien-p'ei, Commander of the Naval Forces, and the Hoppo, Yü-k'un, whereof we entreat your Imperial perusal and instruction.

Postscript - At present the Bogue is in a peaceful condition. I, Lin Tse-hsü, therefore temporarily returned to Canton to manage various matters.<sup>1</sup>

---

<sup>1</sup> Kuo, P. C. A Critical Study of the First Anglo-Chinese War with Documents. Taipei: Ch'eng Wen Publishing Co., 1970, pp. 247-250. Originally published in Shanghai in 1935.

DOCUMENTS

K. LIN'S SECOND LETTER TO THE QUEEN (SHUCK)<sup>1</sup>

128

CHINESE STATE PAPERS.

[ FEBRUARY.

視同仁，利則與天下公  
我大皇帝，撫綏中外一  
王公文，為照會事，洪惟  
怡會同，照會，啖吉，喇國  
部侍郎，廣東巡撫部院  
書兩江總督部堂林兵  
堂鄧欽差大臣兵部尚  
兵部尚書，兩廣總督部

(Letter from the high imperial Commissioner and his Colleagues, addressed to the Queen of Great Britain.)

LIN, high imperial Commissioner, a Director of the Board of War and Governor of the two Keang Provinces, (Hoo-pih and Hoo-nan) Tang, a Director of the Board of War, and Governor of the two Kwang Provinces, (Kwang-tung and Kwang-se) and E, a vice-Director of the Board of War, and Licut. Governor of Kwangtung, hereby conjointly address a public letter to the Sovereign of the English country, by which she may accordingly understand the state of affairs.

It is only our mighty Emperor who tranquilizes the central and foreign lands, and looks upon all with like benevolence. Should there be advantages he renders them common to all beneath the heavens;

<sup>1</sup> Shuck, pp. 128-149, 181-182.



之、害則爲天下去之、益  
 以天下之心爲心也、貴  
 國王累世相傳、皆稱恭  
 順、觀歷次進貢表文云  
 凡本國人、到中國貿易、  
 均蒙大皇帝一體公平  
 恩待、等語、竊喜貴國王  
 深明大義、感激天恩、是

and should injury exist, he removes it for the general benefit of the world, for the mind of Heaven and Earth<sup>22</sup> is the same as that which he himself cherishes. You, the Sovereign of your honourable kingdom, and your ancestors also who have reigned through successive ages have all had the character of having been reverentially obedient which is proved by the repeated sending of tribute, and by despatches which stated as follows: 'All the people of our country who proceed to the Central Land to trade are indebted to the Great Emperor for the greatest justice and the most generous treatment', and such like expressions. We rejoiced that the Sovereigns of your honourable country so thoroughly understood the great principles of right, and have been aroused to such grateful feelings of obligation for our Celestial favours! On this

a

以優年者、已、有、以、但  
 天禮、該、賴、久、夾、致、知  
 朝貿、國、有、衆、帶、毒、利  
 柔易、所、此、夷、鴉、流、已  
 遠之、由、也、良、片、各、不  
 綏利、以、惟、莠、誘、省、顧  
 懷垂、富、是、不、惑、者、害  
 倍二、庶、通、齊、華、似、人  
 加百、稱、商、遂、民、此、乃

account. therefore. has the Celestial Dynasty cherished tenderness toward those from afar, and has redoubled its considerations of regard. and augmented the profits on the trade for these two hundred successive years. Upon these expressions of our kindness, therefore, have you been solely dependant for those riches for which your said country has been famed. But during the commercial intercourse which has been carried on for so long a period, the great number of the barbarian merchants have not been alike, there being good and bad among them, and consequently there has been smuggling. of Opium, and so duped have been our flowery natives that the poison has flowed throughout every Province! Such (smugglers) as these only know how to benefit themselves, regardless of the injuries they inflict upon our people! This it is

販賣之罪則其貽害深  
 處死若追究夷人歷年  
 販鴉片食鴉片者皆應  
 會同查辦凡內地民人  
 本總督部堂巡撫部院  
 遣本大臣來至廣東與  
 憤大皇帝聞而震怒特  
 天理所不容人情所共

which the principles of Heaven disapprove, and which the feelings of mankind publicly reprobate! And our Great Emperor hearing of this, and quaking with wrathful indignation has specially deputed me, a high Minister, to repair to the Province of Canton and, associating with me the Governor and Lieutenant Governor, to proceed to examine into and adjust the present state of affairs.

Every one of our people of the inner land who deal in Opium, and those too who smoke the drug, are all to be condemned to suffer capital punishment. And were we to push our investigations in relation to foreigners who during the many past successive years, have been guilty of trafficking in the drug, thereby entailing upon us the direst calamities.

實具奏幸大皇帝格外  
經本大臣部堂部院據  
稟請繳收全行燬化矣  
箱俱由該國領事義律  
鴉片二萬二千八百三  
悔罪乞誠卽將躉船之  
當誅惟念衆夷尚且知  
而攫利重本爲刑法所

and wresting from us immense wealth, we should find that by the laws they themselves ought to be put to death. But we take into consideration that these said foreigners still knew how to repent of their guilt, and imploringly begging for mercy, they took from their store ships twenty thousand two hundred and eighty three chests of Opium,<sup>43</sup> and through their said country's Superintendent, Elliot, by petition, requested that the surrender might be received, the whole of which was done and destroyed by fire.<sup>44</sup> Of this I, the high Minister, with my colleagues have already transmitted a duly prepared memorial to Court.

We are indebted to that extraordinary kindness of our August Emperor

施原難國令曉度查  
 恩姑屢王衆以斷該  
 以寬貸嚮夷利害不國  
 自首罪定傾化競乃以距  
 者再犯新章心奉知不內地  
 情犯者章定心法天懍六  
 尚者諒能定法朝慙遵七  
 可法貴諭必法也萬

by which those who, of their own accord, make the surrender, can, in view of this circumstance, still have compassion extended to them, and also have their crimes remitted. But those who again violate the laws it will be difficult to be continually extending to them indulgences and they must abide the consequences of the new regulations. We presume that the heart of you, the Sovereign of your honourable country, is turned toward civilization, and that you are consequently able to issue your orders to the whole of your barbarian subjects sincerely to respect our laws. But we must demonstrate to you what is advantageous and what injurious, and then you will understand that the laws of the Celestial Dynasty ought to be implicitly and tremblingly obeyed. Upon examination we find that your country is distant from the inner land sixty or seventy thousand

不顧害人、試問天良安  
 有心爲害、而貪利之極  
 華民之理、卽夷人未必  
 分去、豈有反以毒物害  
 所獲之厚利、皆從華民  
 國之利、利外夷、是夷人  
 爲獲利之厚故耳、以中  
 里、而夷船爭來貿易者、

Le," and your barbarian ships strive with each other in coming here to trade; because of their eager desires for grasping after gain, and inasmuch as the advantages of the Central Kingdom profit those from abroad. The immense profit which these said foreigners reap all arises from the circumstance of the flowery peoples haring it with them, and upon what principle of reason do they, therefore, in return, by a poisonous commodity, pour their injuries upon these very flowery people? Still these foreigners may not designedly cherish in their hearts intentions of purposely inflicting injury, yet coveting such vastness of profit they become regardless of the calamities they entail upon men. Let me ask, how there can exist in their hearts that moral principle implanted by heaven?

在、嚴、害、國、況、外、物、於  
 聞、是、也、則、中、國、利、轉  
 該、固、既、他、國、者、於、貨、  
 國、明、不、國、乎、無、食、皆、  
 禁、知、使、尚、中、一、利、利、  
 食、鴉、爲、不、國、非、於、也、  
 鴉、片、害、可、所、利、用、中、  
 片、之、於、移、行、人、立、國、  
 甚、爲、該、害、於、之、移、會、

We have understood that in your said kingdom the prohibitions against the smoking of Opium are of the sternest severity ; thus the injurious consequences of the use of the drug must be clearly evident to you.

Since then you do not allow it to be injurious to your own country, you ought not therefore to transfer its baneful influences to other nations and more especially to the Middle Kingdom ?

Of the goods of the Middle Kingdom which are exported to the outside nations, there is not a single article but what is profitable to man, being either beneficial for food, or serviceable for general use, or which can be bartered for other goods and all rendered profitable. Has the Middle Kingdom

有如一物爲害外國否、况  
 如茶葉大黃、外國所不  
 可一日無也、中國若斡  
 其利而不恤其害、則夷  
 人何以爲生、又外國之  
 呢羽、嗶嘰、非得中國絲  
 斤不能成織、若中國亦  
 斡其利、夷人何利可圖、

one single article which can be possibly injurious to the outside nations?

And besides, there are our Teas and our Rhubarb which you outside countries could not do without for a single day, and were our Central Realm to grudge them that which is so beneficial, and not show them pity in their distresses, then by what means would these foreigners prolong existance?

And further, as it respects the woollens, camlets and longells of the outside countries, were you not to obtain the raw silk of the Central Empire you would be unable to carry on your manufactures. If the Middle Kingdom were to place limited restrictions upon these advantages after what gain could you barbarians then scheme?



APPENDIX C

1840. 1

CHINESE STATE PAPERS.

137

絲諸貨悉任其販運流  
閉關絕市乃天朝於茶  
無既非中國要需何難  
不過以供玩好可有可  
可勝數而外來之物皆  
而外外國所必需者曷  
而外用物自綢緞磁器  
其餘食物自糖料薑桂

As to the rest of our articles of food, such as sugars, ginger, cassia &c. &c.; and articles also for common use, such as silk piece-goods, porcelain, and so on, which are absolutely indispensable to your outside countries, they exceed all enumeration. But on the other hand, the commodities which are imported here are all fit for nothing more than to look at or to play with; and whether we have them or whether we have them not is a matter of no moment with us.

Since then your goods are not at all necessary to us of the Central Kingdom, what difficulty would we experience in shutting up our ports and cutting off your market? But the Celestial Dynasty allows its Teas and silks, and all kinds of its goods freely to be exported by you every

通、天、內、用、利、其、更、之  
 絕、下、地、且、三、三、以、求  
 不、公、貨、得、倍、倍、害、乎  
 靳、之、物、以、卽、之、人、設  
 惜、也、不、分、不、利、之、使  
 無、該、特、售、賣、自、物、別  
 他、國、自、各、鴉、在、恣、國  
 利、帶、資、國、片、何、無、有  
 與、去、食、獲、而、忍、厭、人

where for consumption, without the slightest disposition of grudging them, and for no other reason than that profits may generally accrue to every realm beneath the heavens. Your honourable country takes away the goods of the Inner Land, by which you not only supply your own selves with food and articles of use, but by taking a part of them and selling them to the various other nations you reap threefold profits.

And were you not to traffic in Opium these threefold gains would nevertheless evidently exist. How then can you bear, by means of an article so injurious to man, and without compunction of conscience, to search thus after gain?

Let us suppose that individuals of another nation

APPENDIX C

1840. ]

CHINESE STATE PAPERS.

139

物之語、是貴國王之政  
給條約、有不許携帶禁  
並聞來粵之船、皆經頒  
已所不欲者、施之於人  
王存心仁厚、自不肯以  
而痛絕之也、向聞貴國  
食、當亦貴國王所深惡、  
販鴉片至英國、誘人買

were to take Opium to the English country to sell, and were to seduce your people to purchase and to smoke it, you, the Sovereign of your honourable kingdom, would also be vastly incensed, and with painful anxiety would you completely exterminate it. Hitherto we have understood that you, the Sovereign of your honourable kingdom, cherish a heart of expanded benevolence, and therefore you must be naturally unwilling to have done to yourself that which you do not desire to do to others."

We have also heard that as to those ships which come to Canton, you have given to the whole of them a binding document which says, 'It is not allowed to carry prohibited articles,' thus it is evident that your said honourable kingdom's official

## DOCUMENTS

140

CHINESE STATE PAPERS.

[ FEBRUARY.

令、衆、既、禁、敢、之、等、所、  
 本、多、行、令、再、喃、處、轄、  
 屬、前、文、之、犯、嘖、本、印、  
 嚴、此、照、嚴、且、及、皆、度、  
 明、或、會、定、聞、嘶、不、地、  
 祇、未、明、必、貴、噶、產、方、  
 因、加、知、使、國、喃、鴉、如、  
 商、察、天、之、王、嘖、片、嗑、  
 船、今、朝、不、都、噲、惟、啊、

orders are originally rigorous and lucid; but because the merchant ships are now exceedingly numerous, they have not, perhaps, been subjected to thorough examination; and it is under these circumstances that we now proceed to address you this public despatch that you may be distinctly aware of the stern severity of the prohibitory laws of the Celestial Court, and determinately must you cause that none dare again to violate them.

And we have moreover understood too, that London, the metropolis of your honourable kingdom, and also Scotland, Ireland \* and such like places originally produce no Opium. But it is only in those regions of Hindoostan, the possessions of your Government, as Bengal,

\* The Chinese sounds for the above places, in the Mandarin dialect, are Lon-tun for London, Shi-ah-jen for Scotland, and Ai-jen for Ireland.

## APPENDIX C

1840. ]

CHINESE STATE PAPERS.

141

啦	嚟	數	造	臭	國	盡	五
慢	嚟	處	累	穢	王	根	穀
達	嚟	連	月	上	定	株	有
啦	嘛	山	經	達	當	盡	敢
嚟	啲	裁	年	天	於	鋤	再
嚟	哇	種	以	怒	此	其	圖
噴	嗎	開	厚	神	等	地	種
以	喇	池	其	恫	處	改	造
達	咁	製	毒	貴	拔	種	鴉

Madras, Bombay, Patna, Benares, Newa (Malwa ?) and Maratta \* in which several places on all the hills is the poppy planted, and tanks are opened for the manufacture of the drug. During successive months and years has been the wide increase of this poison, and its stench and its uncleanness have ascended upwards until the wrath of heaven has been excited, and the gods themselves have become indignant!! And, you the Sovereign of your honourable kingdom, ought determinately, in the above places, to have the whole plucked up by the roots, and cause the ground to be dug up, and transformed by planting the five grains;† and if there be any one who should again dare schemingly to plant or manufacture

\* *Men-ta-ta-ta* for Madras, *Meng-mar* for Bombay, *Pu-ta-ta* for Patna, *Mih-ta-ta* for Benares and *Me-ta-ta* for Maratta.

片利祐子商無豐共  
 者除而孫來非盈在  
 重害神必至天無該  
 治之大所此內朝非國  
 其仁福北地之恩天  
 罪政延舉飲膏朝日  
 此天年矣食積之猶  
 真所壽至居積樂少  
 興長夷處聚利而

Opium, do you award the heaviest punishment for his crimes. Thus would you accumulate advantages, put a stop to the evil, and yours would be a highly benevolent administration, which high heaven would assist, the gods bless, and prolonged would be your years and perpetual your posterity!! Most certainly would you be thus elevated!

As to the barbarian merchants who come to the inner land, their provisions\* and places of residence<sup>as</sup> are wholly bestowed upon them through the rich favours of our Celestial Dynasty; and the accumulated wealth which they have amassed entirely originated in the delightful benefits of our heavenly realms. Those who remain in their own country only a very few days, but

\* Owing to the system of Compravore (or native purveyors) "provisions," for which the foreigner has to pay a Spanish dollar in China, for the very same about a Rupee is paid in India.

在 明 國 遵 今 者 人 民  
 粵 刑 入 喫 定 死 若 何  
 東 古 到 國 華 食 無 由  
 之 今 喫 法 民 者 鴉 轉  
 日 通 國 度 之 亦 片 賣  
 轉 義 貿 况 死 帶 何  
 多 譬 易 天 試 來 由  
 溺 如 尚 朝 思 則 吸  
 教 別 須 乎 夷 華 食

who are in Canton, on the contrary, a great many days, we ought to aid in enlightening them distinctly as to our penal laws. In ancient as well as modern times this has been a generally admitted principle.

Suppose the men of another country were to proceed to the English country to engage in commerce, it would certainly be requisite for them to obey the said English country's laws; and how much more does this apply to the Celestial Empire? The law enacted in relation to the flowery natives is that whosoever of them deals in Opium shall be put to death, and those who smoke it must also die. Now just reflect, that if you barbarians brought no Opium here, then from whence could the flowery natives obtain it to traffic in it? and from whence procure it to smoke?

是豈一况命片斬去  
 奸能命鴉已來絞害  
 夷獨者片乎內地之  
 實予尚之故夷之罪  
 陷以須害人新所謂  
 華生以命人例於為  
 民被害抵豈止帶天  
 於害之人一鴉以下  
 死人之之

It is evident that it is you abandoned foreigners who have really involved in death the natives of the flowery land? And how is it that you only are to be allowed to live? He who takes the life of a single individual thereby necessarily forfeits his own life; and the more so is this applicable to those who pour the calamities of Opium upon mankind. Do these calamities end with the termination of a solitary life? Now therefore the new statute in relation to the barbarians who come to the Inner Land bringing Opium is fixed, and they are to suffer decapitation and strangulation for their crime, which may be said to be the means by which the entire world is to be freed from this crying evil.

And further, upon examination I find that during the present year and second



APPENDIX C

1810.]

CHINESE STATE PAPERS.

145

加體卹凡在一年六個  
 蒙大皇帝格外施恩倍  
 行等語、今本大臣等奏  
 限十月、然後以新例遵  
 請限五月、嘆國本地、請  
 寬限、凡印度港脚屬地、  
 以鴉片禁令森嚴、稟求  
 月間、據該國領事義律

moon (April 9<sup>th</sup> 1839), according to report, your said kingdom's Superintendent Elliot, as our prohibitory orders against Opium were excessively severe, by petition, entreated that the assigned limit<sup>89</sup> might be extended, so that for Hindoostan, \* and all the possessions of India, he requested five months to be the limit, and for England itself, he solicited a term of ten months: after which periods they would obediently act according to the recently established statute, and such like expressions. Now we, the high Minister and my colleagues, have reverentially memorialized the August Emperor, who in his extraordinary mercy, cherishes the most unbounded compassion.

Any one who, within the space of one year and six

\* Yin-foo are the terms here used for Hindoostan and Kiang-keü for India. Ships coming to China from any part of India bearing the British flag are called Kiang-keü-chuen.

威然不忍不教而誅故  
君臨萬國儘有不測神  
之至義之盡矣我天朝  
法斷不寬宥仍可謂仁  
則是明知故犯即行正  
若過此限期仍有帶來  
自首全繳者免其治罪  
月之內誤帶鴉片但能

months brings Opium by mistake, if he will, of his own accord, surrender up the entire quantity of it, will escape the punishment due for his crime. But if this limited period have elapsed, and, as formerly, there be those who have brought the drug hither, then it will be clearly evident that they are willing offenders, and forthwith shall they suffer capital punishment. On no account whatever will forbearance be shown. This then may indeed be denominated the utmost of benevolence, and the very acme of justice.

Our Celestial Court extends its sway over ten thousand kingdoms, and verily does it possess an unfathomable and divine majesty, yet we cannot bear to put men to death without giving them premonitory advice, and for this reason,

此文之後，即將杜絕鴉  
 平之福，幸甚，幸甚，接到  
 益昭恭順之忱，共享太  
 奸除，憲以保，又爾有邦  
 切勿以身試法，王其詰  
 憲典，將鴉片永斷來源  
 圖長久貿易，必當懍遵  
 特明宣定例，該國夷欲

therefore, we specially and distinctly make known to you our established laws. The barbarians of your said kingdom being anxiously desirous of remaining here for a very long time to carry on their commerce, certainly ought, tremblingly to obey the national canons, extirpate forever the very source of the Opium, and tempt not the laws with their own persons. Do you then, the said Sovereign, reprehend those of your subjects who are villianous, and suppress all secret vices, by which means you will secure the regularity of your possessions, demonstrate the sincerity of your respectful obedience to us, and the whole of us together will then enjoy the blessings of abounding peace! Vast will be our joy, and extreme our happiness!! After you have received this document, do you immediately put an entire end to Opium,

片 誘 載 帶 賣 絞 入 限  
 緣 延 現 有 者 立 官 期  
 由 須 行 鴉 爲 決 仍 如  
 速 至 新 片 首 所 予 於  
 行 照 例 烟 斬 帶 一 限  
 移 會 一 來 立 貨 年 內  
 覆 者 夷 內 決 物 六 自  
 切 附 人 地 爲 概 個 首  
 勿 附 人 圖 從 行 月 將

and its causes, and forthwith proceed to send us a reply. Do not be evasive or dilatory, for this is a despatch of the highest importance.

We annex an abstract of the new laws as at present acted upon, as follows.

'Should there be barbarians who come bringing Opium to the inner land, scheming to sell it, the principles shall suffer decapitation immediately, and the accomplices shall forthwith die by strangulation, while the entire amount of the cargo brought shall be confiscated. We hereby grant a limited period of one year and six months, within which defined term, if there be any who will voluntarily take

# APPENDIX C

1840. ]

CHINESE STATE PAPERS.

149

烟 治 初 至 限  
土 罪 九 二 滿  
全 道 日 十  
行 光 奉 年  
呈 十 到 十  
繳 九 諭 二  
者 年 旨 月  
免 六 起 初  
其 月 扣 九

their Opium, and surrender up the entire quantity, they shall escape the punishment due for their crimes.'

In the nineteenth year, sixth moon, and ninth day, (July 19<sup>th</sup>, 1839.) these Imperial commands were received, and reaching to the twentieth year, second moon, and ninth day, the term is completed. \*

(MARCH 12<sup>th</sup>, 1840.)

\* This 'presumptuous document was despatched to England by the British ship "Thomas Coates," during the first week in February 1840, the Commander giving a receipt for the same to the Canton Authorities. The Paper is styled, by the high Commissioner and his colleagues, *kuay-wan*, signifying a document addressed to an equal.

His Excellency Lin, had a large edition of the letter printed by the native bookshoppers of Canton for distribution among the flowery natives. He fully expects a reply.

## DOCUMENTS

1840. ]

CHINESE STATE PAPERS

151.

50. Page 124. The affair at Kowloon happened on the 4th September 1839. A cutter and schooner and some ship's boats on the part of the British Authorities engaged three Chinese junks and a small fort. The attack is said to have been provoked by the Mandarins preventing their people from taking provisions to the shipping. Wounds were received on both sides and some of the Chinese are said to have died.

51. Page 124. The Battle of Chuenpe took place on the 3rd November 1839, between H. M. Ships Volage and Hyacinth and twenty nine Chinese war-junks. The two ships soon sunk three of the junks, caused one to blow up, and dispersed all the remainder with the loss of several hundreds in killed and wounded. Neither on board the Volage or Hyacinth was there any loss of life, nor scarcely any damage sustained. The ships had proceeded to Chuenpe to request a withdrawal of threats which were made against the lives and property of British subjects; the request was not only flatly denied, but twenty nine war junks sallied forth in battle array. The Chinese Authorities sent a representation to the Emperor declaring that the Imperial fleet had gained a complete victory over the barbarian ships; and the officers were accordingly promoted by his majesty.

52. Page 129. In the text read 地 *Ti*, earth, instead of 下 *hea*, beneath. The Emperor of China is represented not only as the Vicegerent of the Heavens but also of the Earth.

53. Page 132. All Chinese official accounts represent the surrender on the part of foreigners as voluntary and repentant; but it is known to both natives and foreigners that the surrender was forced by threats of starvation and death.

54. Page 132. It was a question after the Opium had been surrendered, What should be done with it! The Emperor however soon gave orders for every catty to be destroyed, which was accordingly done by means of lime and salt and water.

55 instead of 54. Page 134. It requires about three and a half 里 *Le*, to make an English mile.

56. Page 139. The "golden rule" 'to do unto others as you would have others do unto you' is found expressed in the Chinese ancient Classics (see the Hea Lun). Chinese morality on paper, however, and Chinese morality in practice are vastly different things.

57. Page 141. The 五穀 *Woo-kuk*, five grains here alluded to are 稻 *Tau*, paddy (i. e. unhusked rice); 粱 *Leang*, Barbadoes millet; 麥 *Mih*, wheat; 黍 *Shoo*, common millet; and 稷 *Tseth* which means a species of small millet, and is sometimes used also to signify the divinity which presides over all grain.

## APPENDIX C

58. Page 142. Foreigners are only allowed very contracted residences in a portion of the suburbs of Canton city. The ware-housing of their goods must be entrusted to natives. Foreigners have long and justly complained of the inconveniences, risks and restrictions connected with their residences in Canton. The Chinese, however, consider that the privilege of allowing foreigners to trade merely is the utmost condescension of Celestial favour.

59. Page 145. The 限 *Heen*, fixed, or assigned limit here refers to a defined period of time in which vessels coming from India, or elsewhere, should not be subjected to the severe penalties of the new statute enacted against those bringing Opium.

60. Page 151. The term 目 *Mùh*, the eye, literally, (instead of 自 *tze* self, as wrongly used in the text) is the same that was applied to Lord Napier by the local Authorities of Canton in 1834. *Mùh* is frequently employed as meaning the Chief individual, head or principal man. It is used also signifying the index of a book &c. &c.

61. Page 156. The Chinese suppose that the world is surrounded by 四海 *Sze-hae*, four seas, and the most important country in the midst of these four seas is 中國 *Chung-kuo* the Central Kingdom (China), which is unparalleled in wealth and intelligence and civilization, and to which, 外國 *Wei-kuo*, every other country is subordinate and tributary.

62. Page 158. The whole amount of 大黃 *Ta-wahng*, Rhubarb exported to foreign countries does not exceed fifteen hundred pounds weight annually. Of 茶葉 *cha-yé*, Teas, there are annually exported to Great Britain nearly forty two millions of pounds. In 1836 upwards of fifty one millions of pounds were shipped to England, and in 1839 upwards of forty millions six hundred thousand pounds. The annual amount taken to the United States is about twelve millions of pounds: to Holland two millions: Russia five millions. The whole amount of Teas exported from China must be about sixty five millions of pounds annually.

The cultivation of the Tea shrub in Java by the Dutch, and in Assam by the English is rapidly on the increase.

63. Page 161. From days of old all along the maritime Provinces of China 海賊 *Hae-tsik*. Pirates, have proverbially abounded. About 1610 they assumed a most formidable attitude, defying Government, and seizing upon and carrying off persons from shore, for whose ransom they demanded large sums of money. Several foreigners also were captured while in their small boats, and were only redeemed by very considerable sums. It was Koshinga, a Chinese pirate, who took Pomona from the Dutch in 1662. At one time the piratical squadron which cruised off the coast of Canton consisted of as

DOCUMENTS

L. LIN'S SECOND LETTER TO THE QUEEN (CANTON PRESS)<sup>1</sup>

THE

**CHINESE REPOSITORY.**

---

VOL. VIII.—FEBRUARY, 1840.—NO. 10.

---

ART. I. *Letter to the queen of England, from the high imperial commissioner Lin, and his colleagues. From the Canton Press.*

LIN, high imperial commissioner, a president of the Board of War, viceroy of the two Keäng provinces, &c., 'Täng, a president of the Board of War, viceroy of the two Kwang provinces, &c., and E, a vice-president of the Board of War, lieut.-governor of Kwangtung, &c., hereby conjointly address this public dispatch to the queen of England for the purpose of giving her clear and distinct information (on the state of affairs) &c.

It is only our high and mighty emperor, who alike supports and cherishes those of the Inner Land, and those from beyond the seas—who looks upon all mankind with equal benevolence—who, if a source of profit exists anywhere, diffuses it over the whole world—who, if the tree of evil takes root anywhere, plucks it up for the benefit of all nations—who, in a word, hath implanted in his breast that heart (by which beneficent nature herself) governs the heavens and the earth! You, the queen of your honorable nation, sit upon a throne occupied through successive generations by predecessors, all of whom have been styled respectful and obedient. Looking over the public documents accompanying the tribute sent (by your predecessors) on various occasions, we find the following:—"All the people of my (i. e. the king of England's) country, arriving at the Central Land for purposes of trade, have to feel grateful to the great emperor for the most perfect justice, for the kindest treatment," and other words to that effect. Delighted did we feel that the kings of

VOL. VIII. NO. X.

63

---

<sup>1</sup> CR, vol. 8, pp. 497-503 (GB).



## APPENDIX C

498

*Letter to the Queen of England*

FRE

your honorable nation so clearly understood the great principles of propriety, and were so deeply grateful for the heavenly goodness (of our emperor):—therefore, it was that we of the heavenly dynasty nourished and cherished your people from afar, and bestowed upon them redoubled proofs of our urbanity and kindness. It is merely from these circumstances, that your country—deriving immense advantage from its commercial intercourse with us, which has endured now two hundred years—has become the rich and flourishing kingdom that it is said to be!

But, during the commercial intercourse which has existed so long, among the numerous foreign merchants resorting hither, are wheat and tares, good and bad; and of these latter are some, who, by means of introducing opium by stealth, have seduced our Chinese people, and caused every province of the land to overflow with that poison. These then know merely to advantage themselves, they care not about injuring others! This is a principle which heaven's Providence repugnates; and which mankind conjointly look upon with abhorrence! Moreover, the great emperor hearing of it, actually quivered with indignation, and especially dispatched me, the commissioner, to Canton, that in conjunction with the viceroy and lieutenant-governor of the province, means might be taken for its suppression!

Every native of the Inner Land who sells opium, as also all who smoke it, are alike adjudged to death. Were we then to go back and take up the crimes of the foreigners, who, by selling it for many years have induced dreadful calamity and robbed us of enormous wealth, and punish them with equal severity, our laws could not but award to them absolute annihilation! But, considering that these said foreigners did yet repent of their crime, and with a sincere heart beg for mercy; that they took 20,283 chests of opium piled up in their store-ships, and through Elliot, the superintendent of the trade of your said country, petitioned that they might be delivered up to us, when the same were all utterly destroyed, of which we, the imperial commissioner and colleagues, made a duly prepared memorial to his majesty;—considering these circumstances, we have happily received a fresh proof of the extraordinary goodness of the great emperor, inasmuch as he who voluntarily comes forward, may yet be deemed a fit subject for mercy, and his crimes be graciously remitted him. But as for him who again knowingly violates the laws, difficult indeed will it be thus to go on repeatedly pardoning! He or they shall alike be doomed to the penalties of the new statute. We presume that you, the sovereign of your honorable nation, on pouring out your

## DOCUMENTS

1840.

*Letter to the Queen of England.*

499

heart before the altar of eternal justice, cannot but command all foreigners with the deepest respect to reverence our laws! If we only lay clearly before your eyes, what is profitable and what is destructive, you will then know that the statutes of the heavenly dynasty cannot but be obeyed with fear and trembling!

We find that your country is distant from us about sixty or seventy thousand miles,\* that your foreign ships come hither striving the one with the other for our trade, and for the simple reason of their strong desire to reap a profit. Now, out of the wealth of our Inner Land, if we take a part to bestow upon foreigners from afar, it follows, that the immense wealth which the said foreigners amass, ought properly speaking to be portion of our own native Chinese people. By what principle of reason then, should these foreigners send in return a poisonous drug, which involves in destruction those very natives of China? Without meaning to say that the foreigners harbor such destructive intentions in their hearts, we yet positively assert that from their inordinate thirst after gain, they are perfectly careless about the injuries they inflict upon us! And such being the case, we should like to ask what has become of that conscience which heaven has implanted in the breasts of all men?

We have heard that in your own country opium is prohibited with the utmost strictness and severity:—this is a strong proof that you know full well now hurtful it is to mankind. Since then you do not permit it to injure your own country, you ought not to have the injurious drug transferred to another country, and above all others, how much less to the Inner Land! Of the products which China exports to your foreign countries, there is not one which is not beneficial to mankind in some shape or other. There are those which serve for food, those which are useful, and those which are calculated for re-sale;—but all are beneficial. Has China (we should like to ask) ever yet sent forth a noxious article from its soil? Not to speak of our tea and rhubarb, things which your foreign countries could not exist a single day without, if we of the Central Land were to grudge you what is beneficial, and not to compassionate your wants, then wherewithal could you foreigners manage to exist? And further, as regards your woollens, camlets, and longells, were it not that you get supplied with our native raw silk, you could not get these manufactured! If China were to grudge you those things which yield a profit, how could you foreigners scheme after any profit at all? Our other articles of food, such as sugar, ginger, cinnamon, &c.,

\* That is, Chinese miles — from 20 to 23,000 British statute miles.

## APPENDIX C

500

*Letter to the Queen of England.*

FEB.

and our other articles for use, such as silk piece-goods, chinaware, &c., are all so many necessities of life to you; how can we reckon up their number! On the other hand, the things that come from your foreign countries are only calculated to make presents of, or serve for mere amusement. It is quite the same to us if we have them, or if we have them not. If then these are of no material consequence to us of the Inner Land, what difficulty would there be in prohibiting and shutting our market against them? It is only that our heavenly dynasty most freely permits you to take off her tea, silk, and other commodities, and convey them for consumption everywhere, without the slightest stint or grudge, for no other reason, but that where a profit exists, we wish that it be diffused abroad for the benefit of all the earth!

Your honorable nation takes away the products of our central land, and not only do you thereby obtain food and support for yourselves, but moreover, by re-selling these products to other countries you reap a threefold profit. Now if you would only not sell opium, this threefold profit would be secured to you: how can you possibly consent to forego it for a drug that is hurtful to men, and an unbridled craving after gain that seems to know no bounds! Let us suppose that foreigners came from another country, and brought opium into England, and seduced the people of your country to smoke it, would not you, the sovereign of the said country, look upon such a procedure with anger, and in your just indignation endeavor to get rid of it? Now we have always heard that your highness possesses a most kind and benevolent heart, surely then you are incapable of doing or causing to be done unto another, that which you should not wish another to do unto you! We have at the same time heard that your ships which come to Canton do each and every of them carry a document granted by your highness' self, on which are written these words "you shall not be permitted to carry contraband goods;" (the ship's register?) this shows that the laws of your highness are in their origin both distinct and severe, and we can only suppose that because the ships coming here have been very numerous, due attention has not been given to search and examine; and for this reason it is that we now address you this public document, that you may clearly know how stern and severe are the laws of the central dynasty, and most certainly you will cause that they be not again rashly violated!

Moreover, we have heard that in London the metropolis where you dwell, as also in Scotland, Ireland, and other such places, no opium

## DOCUMENTS

1840.

*Letter to the Queen of England.*

501

whatever is produced. It is only in sundry parts of your colonial kingdom of Hindostan, such as Bengal, Madras, Bombay, Patna, Malwa, Benares, Malacca,\* and other places where the very hills are covered with the opium plant, where tanks are made for the preparing of the drug; month by month, and year by year, the volume of the poison increases, its unclean stench ascends upwards, until heaven itself grows angry, and the very gods thereat get indignant! You, the queen of the said honorable nation, ought immediately to have the plant in those parts plucked up by the very root! Cause the land there to be hoed up afresh, sow in its stead the five grains, and if any man dare again to plant in these grounds a single poppy, visit his crime with the most severe punishment. By a truly benevolent system of government such as this, will you indeed reap advantage, and do away with a source of evil. Heaven must support you, and the gods will crown you with felicity! This will get for yourself the blessing of long life, and from this will proceed the security and stability of your descendants!

In reference to the foreign merchants who come to this our central land, the food that they eat, and the dwellings that they abide in, proceed entirely from the goodness of our heavenly dynasty:—the profits which they reap, and the fortunes which they amass, have their origin only in that portion of benefit which our heavenly dynasty kindly allots them: and as these pass but little of their time in your country, and the greater part of their time in our's, it is a generally received maxim of old and of modern times, that we should conjointly admonish, and clearly make known the punishment that awaits them.

Suppose the subject of another country were to come to England to trade, he would certainly be required to comply with the laws of England, then how much more does this apply to us of the celestial empire! Now it is a fixed statute of this empire, that any native Chinese who sells opium is punishable with death, and even he who merely smokes it, must not less die. Pause and reflect for a moment: if you foreigners did not bring the opium hither, where should our Chinese people get it to re-sell? It is you foreigners who involve our simple natives in the pit of death, and are they alone to be permitted to escape alive? If so much as one of those deprive one of our people of his life, he must forfeit his life in requital for that which he has taken:—how much more does this apply to him who by means of opium destroys his fellow-men? Does the havoc which he

\* We have been obliged to guess at the names of some of these places.

## APPENDIX C

502

*Letter to the Queen of England.*

FEB.

commits stop with a single life? Therefore it is that those foreigners who now import opium into the Central Land are condemned to be beheaded and strangled by the new statute, and this explains what we said at the beginning about plucking up the tree of evil, wherever it takes root, for the benefit of all nations.

We further find that during the second month of this present year (i. e. 9th April, 1839), the superintendent of your honorable country, Elliot, viewing the law in relation to the prohibiting of opium as excessively severe, duly petitioned us, begging for "an extension of the term already limited, say five months for Hindostan and the different parts of India, and ten for England, after which they would obey and act in conformity with the new statute," and other words to the same effect. Now we, the high commissioner and colleagues, upon making a duly prepared memorial to the great emperor, have to feel grateful for his extraordinary goodness, for his redoubled compassion. Any one who within the next year and a half may by mistake bring opium to this country, if he will but voluntarily come forward, and deliver up the entire quantity, he shall be absolved from all punishment for his crime. If, however, the appointed term shall have expired, and there are still persons who continue to bring it, then such shall be accounted as knowingly violating the laws, and shall most assuredly be put to death! On no account shall we show mercy or clemency! This then may be called truly the extreme of benevolence, and the very perfection of justice!

Our celestial empire rules over ten thousand kingdoms! Most surely do we possess a measure of godlike majesty which ye cannot fathom! Still we cannot bear to slay or exterminate without previous warning, and it is for this reason that we now clearly make known to you the fixed laws of our land. If the foreign merchants of your said honorable nation desire to continue their commercial intercourse, they then must tremblingly obey our recorded statutes, they must cut off for ever the source from which the opium flows, and on no account make an experiment of our laws in their own persons! Let then your highness punish those of your subjects who may be criminal, do not endeavor to screen or conceal them, and thus you will secure peace and quietness to your possessions, thus will you more than ever display a proper sense of respect and obedience, and thus may we unitedly enjoy the common blessings of peace and happiness. What greater joy! What more complete felicity than this!

Let your highness immediately, upon the receipt of this communication, inform us promptly of the state of matters, and of the measure

## DOCUMENTS

1840.

*Memorial to the Emperor*

503

you are pursuing utterly to put a stop to the opium evil. Please let your reply be speedy. Do not on any account make excuses or procrastinate. A most important communication.

P. S. We annex an abstract of the new law, now about to be put in force. "Any foreigner or foreigners bringing opium to the Central Land, with design to sell the same, the principals shall most assuredly be decapitated, and the accessories strangled;—and all property (found on board the same ship) shall be confiscated. The space of a year and a half is granted, within the which, if any one bringing opium by mistake, shall voluntarily step forward and deliver it up, he shall be absolved from all consequences of his crime."

This said imperial edict was received on the 9th day of the 6th month of the 19th year of 'Taoukwang, (19th July, 1839), at which the period of grace begins, and runs on to the 9th day of the 12th month of the 20th year of 'Taoukwang (15th January, 1841), when it is completed.









Commissioner Lin Zexu

# DID LIN ZEXU MAKE MORPHINE? Volume Two

---

G. W. Robinette



GRAFFITI MILITANTE PRESS  
*Valparaiso, Chile*  
2008

*First Hardcover Edition*  
*Graffiti Militante Press*  
*Valparaiso, Chile*  
*Copyright 2008 by Graffiti Militante Press*  
*All rights reserved*

ISBN 978-0-9820787-2-3

# CONTENTS

## Volume II

---

### PART THREE - CHEMISTRY

XII.	20TH AND 21ST CENTURY ALKALOID EXTRACTION	333
	From opium: lime, ammonium chloride and South-east Asian heroin; sodium carbonate and the method of Andre Barbier; lime, salts and the method of W. R. Heumann; ammonia and the method of L. I. Brutko and L. M. Utkin; lime and hydrochloric acid; and alkali hydroxides, salts and the method of Ma. From <i>Papaver somniferum</i> : ammonium sulphate and the Kabay extraction from poppy straw. From <i>Erythroxylum coca</i> : lime and cocaine.	
XIII.	DEROSNE	349
	The age of the alkaloids. Potassium carbonate, lime and Derosne: first, second and third experiments.	
XIV.	SÉGUIN	377
	Lime and Armand Séguin: first and second experiments.	
XV.	SERTUERNER	389
	Earliest work on morphine, later publications, experiments with ammonia and lime, nomenclature.	
XVI.	CONFIRMATION	403
	Salt, lime and Robinet. Salt, lime and Pelletier and Guibourt. Salt, magnesia, lime and Robiquet.	

## CONTENTS – Volume Two

XVII.	CLASSIC METHODS AND COMMERCIAL PRODUCTION	437
	Classic methods: lime, sodium carbonate, sal ammoniac and Merck; lime, ammonium chloride and Pelletier, Thibouméry and Mohr; calcium chloride and Gregory and Robertson. Commercial production.	
XVIII.	OTHER ALKALOIDS	457
	Other opium alkaloids: narcotine; calcium chloride, ammonia, potash and codeine; lime, ammonia and thebaine; and papavereine. Other plant alkaloids: lime and brucine, lime-water and atropine, lime and cinchonine, lime and quinine, lime and solanine, lime and caffeine.	
XIX.	TRADITIONAL METHODS	471
	Alkaloid extraction: lime and the juice of <i>Papaver somniferum</i> , lime and <i>Erythroxylum coca</i> , lime and <i>Areca catechu</i> , lime and <i>Nicotiana rustica</i> , ash and <i>Duboisia hopwoodii</i> , lime and <i>Piper methysticum</i> . Food preservation: lime and salt with eggs. Food preparation: lime and corn.	
PART FOUR - THE CANTON EXPERIMENT		
XX.	THE KNOWLEDGE	479
	19th century european sources: Canton reports and Lin's curiosity about the West and about foreign opium. 19th century Chinese sources: Lin's curiosity about Chinese opium and the Chinese purifiers.	
XXI.	THE INGREDIENTS	507
	Salt. Lime. Seawater and lime. Salt, water and lime. Opium.	

## CONTENTS – Volume Two

XXII.	THE EQUIPMENT	529
	Lin's projects. Management and organization. Site preparation and perimeter security. Storage facilities. Tank security and housing. Tank construction. Supply, logistics, communications, and funding.	
XXIII.	THE RECIPE	555
	Lin's recipe: salt and opium, lime and opium, salt and lime, salt, lime and opium, tank construction and settling. Bridgman's recipe. The DEA's recipe.	
XXIV.	THE RESULT	587
	Discarded: value, funding, and cost of production. Sold: in the West and in China.	
XXV.	CONCLUSION	605

## APPENDICES

D.	CHEMISTRY	611
	Definitions: acids, bases, salts, theories of acids and bases including the Arrhenius, Bronsted-Lowry and Lewis theories, measuring acids and bases, amphoterism, solutions, reactions, precipitation, crystallization, amines, and phenols. Alkaloids: in the poppy and morphine including description and pharmacology, formula and structure, extraction and isolation.	

## CONTENTS – Volume Two

E.	SPECULATION	643
	Perspectives: medical, pharmaceutical, political, military, historical, and personal. Questions: did Lin destroy the opium, does Lin believe he destroys the opium, and was Lin also corrupt. Analogy: the case against Lin and the judgment. Disproval of this hypothesis.	
F.	APOLOGIA	665
	The "destruction" by fire: Lin's tragic fall and national and international propaganda. The "destruction" by salt, lime and water: the two cultures, unfamiliarity with the opiates, Margaret Meadism, the anti-opium bias of the sources, modern anti-opium bias, the devil in the details, and the paucity of the sources.	
	BIBLIOGRAPHY	683
	INDEX	707

DID LIN ZEXU  
MAKE MORPHINE?  
Volume II

---



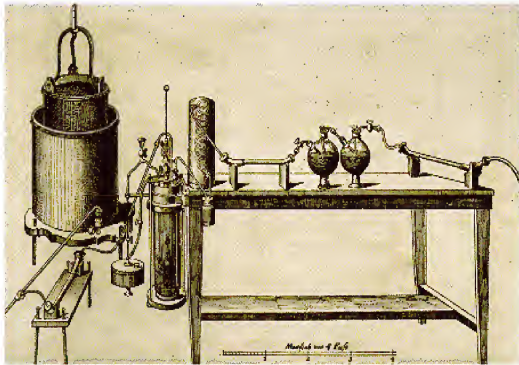
## ILLUSTRATIONS in volume two

1. Destroying the Opium	Front Cover
Source: <a href="http://en.wikipedia.org/Image:Destroy_opium_2.jpg">http://en.wikipedia.org/Image:Destroy_opium_2.jpg</a> , <a href="http://www.spph.com.cn/images/tupian/040720_hmxy.jpg">www.spph.com.cn/images/tupian/040720_hmxy.jpg</a> .	
2. Commissioner Lin Zexu	Frontispiece
Source: <a href="http://de.wikipedia.org/wiki/Bild:Lin-Zexu.jpg">http://de.wikipedia.org/wiki/Bild:Lin-Zexu.jpg</a> and <a href="http://www.blogthetalk.com/-/lin%20Zexu-710862.jpg">www.blogthetalk.com/-/lin%20Zexu-710862.jpg</a> .	
3. Bocca Tigris	Title Page
Source: <a href="http://library.ust.hk/Info/exhibit/maps-2002/thumb/p05.jpg">http://library.ust.hk/Info/exhibit/maps-2002/ thumb/p05.jpg</a> .	
4. Lavoisier's Apparatus (1), (2), and (3).	331-332
Source: <a href="http://www.english.upenn.edu/~knarf/Gifs/lavapp.html">www.english.upenn.edu/~knarf/Gifs/lavapp.html</a> from <i>Oeuvres de Lavoisier</i> . Vol. 1. <i>Traité Élémentaire de Chimie</i> . Paris: Imprimerie Impériale, 1864, digitized at <a href="http://moro.imss.fi.it/lavoisier/Lavoisier_opere.asp">http://moro.imss. fi.it/lavoisier/Lavoisier_opere.asp</a> , plates 11, 4, and 7 respectively.	
5. Diorama, HK Museum of History; Solvay Schematics	477-478
Sources: Jun E. Tan, <a href="http://images.google.com/junex2.blogspot.com/2007_01_01_archive.html">http://images.google.com/junex2.blogspot. com/2007_01_01_archive.html</a> ; Solvay process above, <a href="http://en.wikipedia.org/wiki/Image:Solvay_Process.PNG">http://en.wikipedia.org/wiki/Image:Solvay_Process.PNG</a> by Eric. A. Schiff, 2006; and Solvay process below, <a href="http://scifun.chem.wisc.edu/.../SodiumBicarb.html">http://scifun. chem.wisc.edu/.../SodiumBicarb.html</a> .	
6. Sherlock Holmes working with chemical apparatus, 1892	609
Source: <a href="http://www.nlm.nih.gov/.../media/detailed/n_c_101.jpg">www.nlm.nih.gov/.../media/detailed/n_c_101.jpg</a> , from Doyle, Arthur Conan. "The Adventure of the Naval Treaty," in <i>The Memoires of Sherlock Holmes</i> . London: George Newnes, 1893. Artist: Sydney Paget. Kent State University Libraries, Department of Special Collections and Archives.	

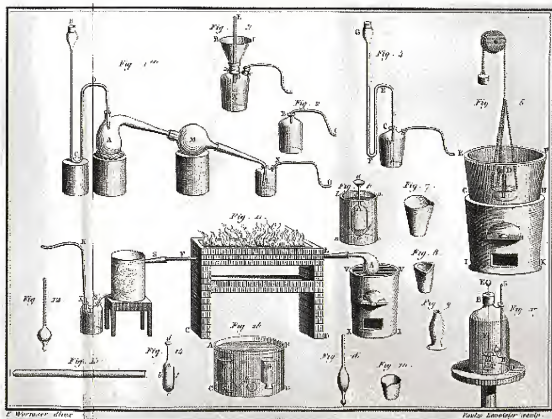
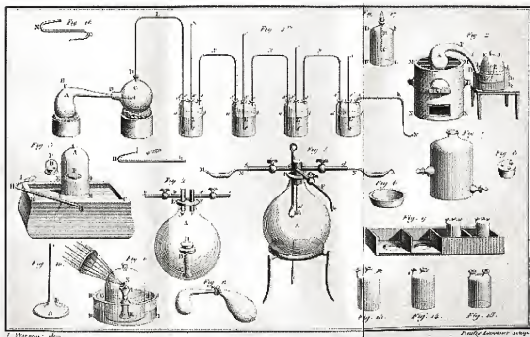
### PART THREE CHEMISTRY

---

*I*N the 21st century, among the variety of methods available, lime and a salt (ammonium chloride, not sodium chloride) are still being used to extract morphine from opium and cocaine from coca leaf. In the early 19th century, European chemists and pharmacists used lime and various salts (including common salt) to extract a number of alkaloids from opium, *Papaver somniferum* and other medicinal plants. In many different parts of the world traditional cultures still extract alkaloids from medicinal plants with lime and prepare and preserve food with both lime and sea salt, three undoubtedly ancient practices.



Lavoisier's Apparatus (1)



Lavoisier's Apparatus (2) and (3)

## XII 20TH AND 21ST CENTURY ALKALOID EXTRACTION

---

- XII. 20TH AND 21ST CENTURY ALKALOID EXTRACTION
- A. FROM OPIUM
    - 1. LIME, AMMONIUM CHLORIDE AND SOUTHEAST ASIAN HEROIN
    - 2. SODIUM CARBONATE AND THE METHOD OF ANDRE BARBIER
    - 3. LIME, SALTS AND THE METHOD OF W. R. HEUMANN
    - 4. AMMONIA AND THE METHOD OF L. I. BRUTKO AND L. M. UTKIN
    - 5. LIME AND HYDROCHLORIC ACID
    - 6. ALKALI HYDROXIDES, SALTS, AND THE METHOD OF MA
  - B. FROM *PAPAVER SOMNIFERUM*
    - 1. AMMONIUM SULPHATE AND THE KABAY EXTRACTION FROM POPPY STRAW
  - C. FROM *ERYTHROXYLUM COCA*
    - 1. LIME AND COCAINE
  - D. DISCUSSION AND QUESTIONS

*BOTH* complex and simpler methods of extracting the various alkaloids from opium and from medicinal plants like *Papaver somniferum* coexist side by side in this era. More complex methods of extraction/production of alkaloids include plant cell biotechnology, solid substrate and solid state fermentation, metabolic engineering, supercritical fluid extraction, organic synthesis, ring-closing metathesis, sonication-solid phase extraction, nanotechnology,

photoinduced electron transfer, and genetic modification.<sup>1</sup> Though there is a heavy reliance upon advanced technology in this period, many of the methods continue to need acids, bases and salts (in some cases lime and salt) to help extract and precipitate the alkaloids from opium.

#### A. FROM OPIUM

##### 1. LIME, AMMONIUM CHLORIDE, AND SOUTHEAST ASIAN HEROIN

It may be helpful to begin with a simple but still widely used method. The U.S. Drug Enforcement Administration (DEA) published a now famous booklet (DEA 20026) describing the process used by field chemists in Southeast Asia to extract morphine from locally gathered opium in order to produce heroin. The process of extracting the morphine has many similarities with that of Lin in that it uses *lime* to dissolve and a *salt* (ammonium chloride, not sodium chloride) to precipitate the alkaloids. The relevant sections are reproduced below (*italics added*):

##### EXTRACTION OF MORPHINE FROM OPIUM

Raw or cooked opium contains more than 35 different alkaloids, including morphine, codeine, and thebaine. In Mainland Southeast Asia, the morphine alkaloid alone accounts for approximately 10 percent of the total weight of opium. Heroin manufacturers must *first extract the morphine from the opium*, before converting the morphine to heroin. The extraction is a simple process, requiring only a few chemicals and a supply of water. Morphine sometimes is extracted from opium in small clandestine laboratories, which are typically set up near the opium poppy fields. Since the morphine base is about one-tenth the weight and volume of raw opium, it is desirable to reduce the opium to morphine before transporting the product from the field to a heroin laboratory.

The process of extracting morphine from opium involves dissolving opium in boiling water, adding *lime (calcium oxide)*, or *slaked lime (calcium hydroxide)*, or *limestone (calcium carbonate)* to precipitate non-morphine

---

<sup>1</sup> Primary Information Services found at [www.primaryinfo.com/projects/alkaloids.htm](http://www.primaryinfo.com/projects/alkaloids.htm).

alkaloids, and then pouring off the morphine in solution. *Ammonium chloride* is then added to the solution to precipitate morphine from the solution. The chemicals used to process opium to morphine have a number of legitimate purposes and are widely available on the open market. An empty oil drum, some cooking pots, and filter cloths or filter paper are needed.

The following is a step-by-step description of morphine extraction in a typical Mainland Southeast Asian laboratory:

An empty 55-gallon oil drum is placed on bricks about a foot above the ground and a fire is built under the drum. *Thirty gallons of water* are added to the drum and brought to a boil. *Ten to 15 kilograms of raw opium* are added to the boiling water.

With stirring, the raw opium eventually dissolves in the boiling water, while soil, leaves, twigs, and other non-soluble materials float in the solution. Most of these materials are scooped out of the clear, dark brown liquid opium solution.

*Slaked lime (calcium hydroxide)* or, more often, a readily available chemical fertilizer with a high content of *lime*, is added to the solution. *Lime* will convert water-insoluble morphine alkaloid into water-soluble calcium morphenate. (Other opium alkaloids do not react with *lime* to form water-soluble calcium salts, as does morphine.) Codeine is an opium alkaloid that is slightly water-soluble and some codeine will be carried over with the calcium morphenate in the liquid. Otherwise, for the most part, the other alkaloids will become a part of the sludge.

As the solution cools, the morphine solution is scooped from the drum and poured through a filter. Cloth rice sacks are often used as filters and can then be squeezed in a press to remove most of the solution from the wet sacks. Liquid saponated *cresol* (lysol) is commonly added to the solution to facilitate filtering. The morphine-rich solution is then poured into large cooking pots and reheated but, this time, not boiled.

*Ammonium chloride* (a powder) is added to the heated calcium morphenate solution to adjust the alkalinity to a pH of 8 to 9, and the *solution is then allowed to cool. Within 1 or 2 hours, morphine base precipitates (crashes) out of the solution and settles to the bottom of the cooking pot.*

The solution is then poured off through cloth filters. *Any solid morphine base chunks in the solution will remain on the cloth.* The morphine base is removed from both the cooking pot and from the filter cloths, wrapped and squeezed in cloth, and then dried in the sun. When dry, the crude morphine base is a coffee-colored coarse powder. This form of morphine is commonly known by the Chinese term *pi-tzu* in Mainland Southeast Asia.

If morphine base is to be stored or transported to another location, it may be pressed into blocks. Crude morphine base is generally 50 percent to

70 percent morphine, and is an intermediate product in the heroin process. (This morphine base is generally not used by addicts.)

This crude morphine base may be further purified (and changed to morphine hydrochloride) by dissolution in hot water and hydrochloric acid, then adding activated charcoal, reheating, and filtering. The solution is filtered several times before being allowed to cool. *As the solution cools*, morphine hydrochloride precipitates out of the solution and settles to the bottom. *The precipitate is trapped (or captured) by filtration.*

If the morphine hydrochloride is to be stored or transported to another location, it may be pressed into bricks. Morphine hydrochloride (often tainted with codeine hydrochloride) is usually pressed into brick-sized blocks in a press and wrapped in paper or cloth. The most common block size is 2 inches by 4 inches by 5 inches, and weighs about 3 pounds (1.3 kilograms). It takes a full day to extract morphine from opium.<sup>2</sup>

## 2. SODIUM CARBONATE AND THE METHOD OF ANDRE BARBIER

In 1950, Andre Barbier described a variation on several nineteenth century methods. He finds it useful to adjust the alkalinity to precipitate the alkaloids. First, he dissolves the opium in water, stirs it and heats it:

Five parts of water are used to one part of opium: the opium is cut into thin slices and placed in the extractor which contains the water for extraction. In order to avoid blocking, the stirrer is set in motion as soon as any opium is placed in the extractor. The water is heated to 45 degrees for the first extraction in order to facilitate the disintegration of the opium; this heating is unnecessary when opium marc is being extracted.<sup>3</sup>

---

<sup>2</sup> "Opium Poppy Cultivation and Heroin Processing in Southeast Asia," U.S. Department of Justice, Drug Enforcement Administration, March 2001, DEA - 20026, pp. 10-12, found at <http://www.shaps.hawaii.edu/drugs/dea20026/dea20026.html>; a second version is available at <http://opioids.com/jh/index.html> pp. 13-15 and a third 1993 version of the same booklet can be found at [www.erowid.org/archive/rhodium/chemistry/opium.html](http://www.erowid.org/archive/rhodium/chemistry/opium.html).

<sup>3</sup> Barbier, Andre. "The Extraction of Opium Alkaloids," United Nations Office on Drugs and Crime. Found at [http://www.unodc.org/unodc/bulletin/bulletin\\_1950-01-01\\_3\\_page004.html](http://www.unodc.org/unodc/bulletin/bulletin_1950-01-01_3_page004.html), p. 4.

Next, he concentrates the liquid and then precipitates all of the alkaloids with *sodium carbonate* (italics added):

When the opium liquids are reduced to one litre per kilogram of opium, their volume is 300 litres. They are placed in a 1,000 litre apparatus made of lead-coated iron and equipped with a lead-coated stirrer and a double jacket of sheet iron which permits of steam-heating and water-cooling. The liquids are heated to 85°-90° and *precipitated at that temperature by powdered Solvay-process sodium carbonate*. When alkalinity to phenolphthalein is reached, *no further Solvay powder is added; ammonia is given off*. After heating for one hour, the alkalinity to phenolphthalein is again tested and, if it has disappeared, more Solvay powder is added. When persistent alkalinity is achieved, *the mixture is cooled; there is a precipitate of small grains* which are filtered off and washed. They are then dried without heat in order to remove as much of the water as possible, as *the total alkaloids* are not dried in the oven before the treatment is continued.<sup>4</sup>

The Solvay process uses salt brine and heated limestone, with ammonia as a catalyst, to produce sodium carbonate, as will be discussed more in detail in chapter twenty-one.

### 3. LIME, SALTS, AND THE METHOD OF W. R. HEUMANN

In 1957, D. Sc. Walter R. Heumann, Assistant Professor of Chemistry at the University of Montreal, Canada described a process using Iranian opium. Though it relies heavily on industrial solvents and some advanced technology, in part, he also uses *lime* and one or more *salts* to precipitate the alkaloids. Opium is first dissolved (italics added):

The dissolution of the opium is done in the usual manner. The opium is cut into slices and stirred with *five times its weight of water*. Heating to 45-50°C is applied to speed up disintegration. The one-pound bricks of Iranian opium can be used without cutting them.<sup>5</sup>

---

<sup>4</sup> Barbier, p. 6.

<sup>5</sup> Heumann, W. R. "The Manufacture of Alkaloids from Opium," found at [www.unodc.org/unodc/en/bulletin/bulletin\\_1950-01-01\\_page007.html](http://www.unodc.org/unodc/en/bulletin/bulletin_1950-01-01_page007.html), p. 4.



The dissolved opium is then filtered and washed:

The filtration and washing of the completely disintegrated opium follows to some extent the known pattern of the counter-current method as described by Schwyzer and Barbier but does not aim at obtaining a highly concentrated extract. The marc which remains after the separation of the aqueous extract by filtration is washed five times with 1 to 2 parts of 2% acetic acid for one part of opium. The main extract, together with the first two washings-i.e., about eight parts of liquid for one part of opium, is used for precipitating the alkaloids, whereas the following three washings are used instead of water to extract the following batch of opium. Once the extraction process is started, pure water will be used for washings only, and acetic acid will be added, starting with the second washing.<sup>6</sup>

His filtration is both modern and traditional, using vacuum and wood (*italics added*):

The filtration is done by vacuum, which has already been recommended by Schwyzer. As contrasted with Barbier's observation, even the highly resinous Iranian opium can be satisfactorily filtered by vacuum, under certain conditions. The opium extract, together with the marc, is placed on the filter and allowed to drain without vacuum over night. The following morning the vacuum is applied and the filtration completed within approximately six hours. The remaining marc, which now forms a solid pasty mass, is thoroughly mixed with the washing water and allowed again to drain without vacuum over night, and so forth. As the washings progress the filtration becomes easier, so that the last two washings can be done within one day with vacuum being applied right from the beginning. On a cylindrical vacuum filter of the Buchner type of 1,400 mm in diameter at least 200 lb of Iranian or 250 lb of Turkish opium can be filtered as described. *Wooden filters are very convenient, as they are inexpensive, durable and easy to maintain.* One batch will occupy a filter for six days, which means that even a medium-size manufacture will require quite a number of filters and much space. This may appear to be a disadvantage, but there are definite merits in this method. All operations with the opium are done on the filter itself, which means clean work without losses. Furthermore, the washings are very efficient, as the marc is macerated thoroughly when the washings are allowed to drain freely

---

<sup>6</sup> Heumann, pp. 4-5.

during the night. In other methods, such as centrifuging or decanting, work is either dirty or separation inefficient and loss of alkaloids therefore inevitable.<sup>7</sup>

He then precipitates the alkaloids using a combination of bases and salts (*italics added*):

The opium extract is neutralized by the addition of *sodium hydroxide* solution and the pH is adjusted to 7.0. The resulting *crystalline precipitation of narcotine* is easily filtered off by centrifuging and washed with water until free from other alkaloids. Sometimes this raw narcotine may contain small amounts of papaverine. In such cases the precipitation should be tried at a slightly lower pH. To the filtrate and the washings of the raw narcotine, a concentrated solution of *calcium chloride* is added to precipitate meconic acid as its insoluble *calcium salt*. The latter is filtered by centrifuging and washed until free from alkaloids as easily as the narcotine. If narcotine is not to be used, *both narcotine and meconic acid can be precipitated together* by replacing *sodium hydroxide* with *calcium hydroxide (slaked lime)*. The combined filtrates and washings from the meconate are further precipitated by adjusting the pH to 9.0-9.2 by the addition of *powdered sodium carbonate*. *The total alkaloids, which precipitate now*, are centrifuged and washed the following day. After drying at a temperature not exceeding 60°C, *the raw total alkaloids are obtained as a brown, granular powder*. The mother-liquors from these raw alkaloids still contain a small amount of alkaloids, which are recovered by solvent extraction as described later.<sup>8</sup>

At this point, using water, filters, acids, bases and salts, he has precipitated almost all of the alkaloids from the opium and dried them to obtain "a brown, granular powder."<sup>9</sup> How much of the alkaloids can he extract? "The raw total alkaloids from 100 kg opium weigh between 15 and 20 kg, depending on the opium used."<sup>10</sup> He now wishes to separate the morphine from the other alkaloids and for this he uses trichlorethylene and steam distillation: "The almost dry raw morphine is removed as a light brown powder. When completely dry, it is difficult to handle without loss due to

---

<sup>7</sup> Heumann, p. 5.

<sup>8</sup> Heumann, pp. 5-6.

<sup>9</sup> Heumann, p. 6.

<sup>10</sup> Heumann, p. 6.

dusting. The yield from 100 kg of opium is from 18 to 20 kg of this product, containing about 20% water."<sup>11</sup>

In order to purify the morphine, he mentions three methods. The first uses the same ingredients of the Southeast Asian chemists, *slaked lime* and *ammonium chloride* (italics added):

1. Purification by *lime*. - The slightly humid raw morphine is mixed in an open stirring vessel with four times its weight of water, and *slaked lime* is added until the solution remains strongly alkaline to phenolphthaleine. The solution now contains all the morphine as calcium morphinate and is filtered off by vacuum on a Buchner filter. The residue on the filter, a mixture of *lime*, impurities and maybe some *calcium meconate*, is washed free of morphine and then discarded. The combined filtrates are transferred to an open stirring vessel, where a 20% *ammonium chloride* solution is added to bring about *complete precipitation of the morphine base*.<sup>12</sup>

A second method of purification uses ethanol. He purifies the result from either method using tartaric acid, charcoal, sodium hydroxide, sodium bisulfite, ammonia and sodium carbonate. The mother liquors from this last purification still retain some morphine. They are made (italics added)

strongly alkaline with with *slaked lime*, whereupon a massive precipitate of calcium tartrate forms. ... The calcium tartrate is centrifuged and washed with water until free of morphine, and then discarded. The combined filtrates are treated with a 20% solution of *ammonium chloride* in order to precipitate the morphine, which is centrifuged and then purified again, either by alcohol or tartaric acid or both.<sup>13</sup>

He further describes methods to extract the secondary alkaloids, papaverine, codeine, thebaine and narcotine.<sup>14</sup>

---

<sup>11</sup> Heumann, p. 7.

<sup>12</sup> Heumann, p. 7.

<sup>13</sup> Heumann, p. 4.

<sup>14</sup> Heumann, pp. 7-9.

#### 4. AMMONIA AND THE METHOD OF L. I. BRUTKO AND L. M. UTKIN

Working at the S. Ordzhonikidze All-Union Pharmaceutical Chemistry Research Institute, Moscow, the authors recorded a method using polybuffer separation on 18 May 1966. It uses both alcohol and a strong base, ammonia (*italics added*):

The methods of polybuffer separation have been applied to the opium alkaloids and from this a method has been developed for separating the following alkaloids from an alcoholic *ammoniacal* opium mother liquor: morphine, codeine, thebaine, and papaverine. A basic scheme for the isolation of the same main opium alkaloids and narcotine from opium raw material has also been proposed.<sup>15</sup>

#### 5. LIME AND HYDROCHLORIC ACID

This method uses modern solvents, hydrochloric acid and *lime* (*italics added*):

Another major method for processing opium to separate the principal alkaloids is based on dispersion of opium in water, which is then followed by extraction with *hydrochloric acid*. This then is followed by separation of the insoluble material with plate-and-frame filtration. This is then followed by separation of morphine and codeine from the other principal alkaloids by extraction with chloroform. The aqueous morphine and codeine stream is treated with *lime* to remove meconic acid. Morphine is then purified using multiple recrystallizations. Morphine and codeine are then separated by extraction with toluene, then the aqueous morphine stream is extracted with fusel oil. The remaining alkaloids are separated from the chloroform by acid extraction and evaporation. The narcotine, papaverine and thebaine are then obtained by fractional crystallization.<sup>16</sup>

<sup>15</sup> Brutco, L. I. and Utkin, L. M. "Polybuffer Separation of Opium Alkaloids," *Pharmaceutical Chemistry Journal*, vol. 1, no. 1 (New York, Springer, 1967), pp. 39-41, translated from *Khimiko-Farmatsevticheskii Zhurnal*, No. 1, pp. 43-45, January, 1967, found at [www.springerlink.com/content/k905291g81414570/](http://www.springerlink.com/content/k905291g81414570/).

<sup>16</sup> "Extraction of Alkaloids from Opium," WO/2005/123743, p. 1, found at [www.wipo.int/pctdb/en/wo.jsp?wo\(equals\)2005123743](http://www.wipo.int/pctdb/en/wo.jsp?wo(equals)2005123743).

## 6. ALKALI HYDROXIDES, SALTS AND THE METHOD OF MA

Ma, et al. on April 25, 2000 obtained a patent (U.S. Patent No. 6,054,584) for a process for extracting and purifying morphine from opium. This method shows again the mix of industrial solvents (alcohol, benzene, toluene) as well as the use of acids and bases to adjust alkalinity and salts to prevent the formation of an emulsion and aid in the precipitation of the alkaloids (*italics added*):

A process for extracting morphine from opium is described. In the process, opium is extracted with a basic alcoholic solution. The basic alcoholic solution is filtered and the alcohol removed from the filtrate to leave a residue. The residue is then extracted with a *basic aqueous solution having a pH of at least 11*. The basic aqueous solution may be filtered to remove any solid matter remaining after the aqueous extraction step, and then be stirred with a sufficient amount of a *salt* to avoid emulsion formation. The basic aqueous solution or filtrate is then extracted with benzene or toluene. Next, adjusting the pH of the basic aqueous filtrate to pH 8.5 to 9.5 allows the morphine to precipitate and be recovered.<sup>17</sup>

This is the abstract but the details are worth a closer look (*italics added*):

According to the invention described herein, morphine is extracted from opium by stirring and/or heating, or preferably refluxing, opium in a basic solution of an alcohol, preferably methanol at about pH 9. *The pH may be adjusted by the addition of an inorganic base (alkali hydroxide, or carbonate), ammonia, and the like. Preferred inorganic bases include, but are not limited to, sodium hydroxide and potassium hydroxide.* After the extraction is complete, the alcohol extract is filtered to remove the undissolved particulate matter. The alcohol itself is then removed from the extracted alkaloids, preferably by evaporation under reduced pressure. The resulting residue, which contains the alkaloids, is mixed or *extracted with a basic aqueous solution having a pH of at least 11*, preferably an aqueous solution of an *alkali hydroxide*. This converts the morphine free base present into its anionic (morphinate) form which is soluble in basic solutions of pH values of 11 or above. *Other opium*

---

<sup>17</sup> Ma, et al. "Process for Extracting and Purifying Morphine from Opium," U.S. Patent 6,054,584 found at [www.erowid.org/archive/rhodium/chemistry/morphextr.html](http://www.erowid.org/archive/rhodium/chemistry/morphextr.html), p. 1.

*alkaloids are relatively insoluble and, in general, at least partially precipitate out of the basic aqueous solution.* After removing any precipitate, preferably by filtration, the remaining alkaloids are separated from the morphine containing basic aqueous solution by extraction with a substantially water-immiscible solvent, such as toluene or benzene. Finally, the morphine free base is precipitated out of the resulting aqueous solution by adjusting the pH of the aqueous filtrate to pH 8.5 to 9.5. Preferably, the pH to precipitate the morphine ranges from about 9 to 9.3, and most preferably is about 9.1. This is accomplished by adding either an organic acid or a mineral acid. The yield and purity of morphine produced by this procedure are economically satisfactory. The morphine obtained from this process may then be further purified by known methods or utilized directly in a further process to convert it into codeine.<sup>18</sup>

Ma mentions numerous possible variations in solvents, bases and salts (*italics added*):

Particularly preferred alcohols include methanol, ethanol, and isopropanol. ... According to the invention, the residue remaining after removing the alcohol is then extracted with a basic aqueous solution having a pH of at least 11. Preferably, the basic aqueous solution is a solution of an *alkali hydroxide* such as *sodium hydroxide* or *potassium hydroxide*. *Solutions of other bases may also be used.* Maintaining the pH of the aqueous extract at this pH and preferably within a relatively narrow preferred range allows high quality morphine to be obtained with good recovery.<sup>19</sup>

Ma is careful during this process to avoid forming emulsions (*italics added*):

To avoid emulsion formation, the aqueous solution/filtrate may, before extraction with the substantially water-immiscible solvent first be treated with a sufficient amount of an alkali metal salt or alkaline earth metal *salt*, for example 0.5 to 5 grams *salt* for each 5 grams of opium.<sup>20</sup>

Again, Ma mentions a variety of options in the choice of salt (*italics added*):

---

<sup>18</sup> Ma, p. 2.

<sup>19</sup> Ma, p. 2-4.

<sup>20</sup> Ma, pp. 2-4.

Preferred *salts* are, for example, lithium chloride, lithium bromide, lithium acetate, *sodium chloride*, sodium bromide, sodium acetate, potassium chloride, potassium bromide, or potassium acetate. A preferred amount of the salt is 0.5 to 2 grams per 5 grams of opium. *Sodium chloride* and sodium acetate are preferred salts with sodium acetate being particularly preferred.<sup>21</sup>

Ma gives an example (*italics added*):

5 g of opium were cut into small pieces and extracted by reflux with 0.4 g of sodium hydroxide in 25 ml of methanol for 1 to 2 hrs. The methanol extract was then filtered to remove particulate materials. After addition of 1 g of filter aid to the methanol extract, which contained 465 to 485 mg of morphine, the methanol was removed under reduced pressure. The residue was then mixed with 5.5 ml of 1.0 N *sodium hydroxide* solution at 35 degrees C. for 10 min. and the pH adjusted to about 11.5 to 11.9 with 50% acetic acid in water. This aqueous extract was then filtered and the precipitate washed with 5.5 ml of 0.01 N *sodium hydroxide* solution. The combined aqueous filtrate was stirred with 0.5 g of sodium acetate for 10 minutes and filtered again. The filtrate was then extracted twice with 5 ml of toluene and the pH of the aqueous filtrate was then adjusted to pH 9.1, with 50% acetic acid in water. The mixture was allowed to remain for a period of 6-10 hrs at room temperature for complete precipitation and was then filtered. This precipitate was washed with water and dried at room temperature. This final precipitate contained 400-426 mg of morphine, which represented a recovery of 86-88% based upon the amount of morphine in the initial methanol extract. The purity of morphine following this procedure was 84% to 86% by weight.<sup>22</sup>

#### B. FROM *PAPAVER SOMNIFERUM*

It is not necessary to first extract opium from *Papaver somniferum* in order to obtain the alkaloids. This can be done directly from the raw plant. Without the addition of the chemicals, the process shares a number of similarities with the making of a traditional poppy tea.

---

<sup>21</sup> Ma, pp. 2-4.

<sup>22</sup> Ma, pp. 8-9.

## 1. AMMONIUM SULPHATE AND THE KABAY EXTRACTION FROM POPPY STRAW

The Kabay method dates to the early decades of the 20th century. The plants are first cut fresh and then dried, leaving only stalks and heads, a product known as "poppy straw." This process again uses a combination of industrial solvents and bases and salts (*italics added*):

The manufacture of morphine direct from poppy straw was only achieved one century after the first experiments. In 1925, a young Hungarian, J. Kabay, devised a method for the production of morphine from green poppy plants: in 1927, he founded in his native country a small chemical factory under the name of "Alkaloida." Kabay in his patent specification of 30 November 1931, made known the principle of the extraction of morphine from poppy straw .... The poppy capsules (with stalks not more than 10 cm in length) are thrashed, dried and then treated with an extracting liquid which consists of a solution of *sodium bisulphite* in water. The resultant aqueous extract is concentrated in vacuo using the "counter-current principle" method until it attains a syrupy consistency. The pasty substance thus obtained, which has a morphine content of 1% to 1.2%, is then treated with alcohol or other organic solvent. The solution - which, besides morphine, contains a lesser amount of other extractable material than the aqueous extract - is then distilled, yielding an extract having a morphine content of 2% to 4%. From this mixture of alkaloids in alkaline medium *the morphine base can be precipitated by treating the mixture with ammonium sulphate in the presence of benzene*. The product will have a morphine content of over 50%, and, by means of repeated precipitation or crystallization, it is possible to obtain from it the pure morphine base and morphine salts or semi-synthetic derivatives.<sup>23</sup>

Another version of this method uses a 1% aqueous solution of copper sulfate."<sup>24</sup> A modern variation of the poppy-straw method is used by Johnson and Johnson and Tasmanian Alkaloids, producing nearly one quarter of the world's legal morphine.<sup>25</sup>

---

<sup>23</sup> Bayer, Istvan. "Manufacture of alkaloids from the poppy plant in Hungary." Found at [www.poppies.org](http://www.poppies.org).

<sup>24</sup> Heumann, p. 7.

<sup>25</sup> Heumann, p. 7.



### C. FROM *ERYTHROXYLUM COCA*

For a note of comparison, among the many advanced methods for extracting and isolating alkaloids from other plants is a simpler example that uses acids, bases and salts.

#### 1. LIME AND COCAINE

Lime and ammonium chloride are also used to help extract the alkaloid cocaine from the leaves of *Erythroxylum coca* (italics added):

Cocaine powder is impossible to make without certain chemicals. The general method is as follows: at the beginning of the process, after the leaves are harvested, they must be dried and treated with either *lime*, *sodium carbonate*, or potash. Next, the leaves are soaked in kerosene to extract the leaf's fourteen alkaloids, one of which is cocaine. ... Many of the same chemicals used to make cocaine, such as *lime*, *ammonium chloride*, acetic anhydride, acetone, hydrochloric acid, and ether, are also used in the process of transforming opium to morphine base and then heroin.<sup>26</sup>

### D. DISCUSSION AND QUESTIONS

As regards method one, that of Southeast Asian morphine extraction from opium, Kuo's Lin says that he did not use this method and neither of the barbarian accounts mention that the tanks were heated from below, that he threw in the lime first and the salt later, used cloth rice sacks for filters, or added lysol or ammonium chloride. There has been no evidence presented so far regarding when this method began to be used in Southeast Asia. The language of the DEA's investigator echoes that of Bridgman as regards the filter: the observer of the Southeast Asian chemists writes that "(a)ny solid morphine base chunks in the solution will remain on the cloth" while Bridgman nearly two centuries earlier observes that tank three "was furnished with a screen, made fine

---

<sup>26</sup> Lusane, Clarence. *Pipe Dream Blues*. Cambridge, MA: South End Press, 1991, p. 98 (GB).

like a sieve, so as to prevent any large masses of the drug from finding their way into the creek." The process used by the Southeast Asian chemists and that chosen by Lin include a settling time. There are other similarities with Lin's method in both the simplicity of the process and the choice of ingredients, in particular the lime.

Barbier suggests that heating is useful for dissolution but not necessary for extracting the residue. He uses Solvay-process sodium carbonate to precipitate all the alkaloids. The Solvay process uses lime, a salt brine and ammonia as a catalyst to produce sodium carbonate, as will be discussed in more detail in chapter twenty-one.

Heumann's method heats the opium, but only to 45-50 degrees centigrade, not to boiling, suggesting some heat is useful but not necessarily essential. He washes his marc (residue) with a slight solution of acetic acid. He uses wooden filters. Lin used some type of screen, "made fine like a sieve" though Bridgman does not say of what it was made. First Lt. Bingham observed a sieve made of canes at a coastal Chinese salt works. The DEA's Southeast Asian chemists use rice-cloth filters. Lin builds with bamboo. Heumann uses *sodium hydroxide* to precipitate narcotine. He uses *calcium chloride* to precipitate the meconic acid from the narcotine. But if he is not interested in either the meconic acid or the narcotine, he precipitates them both using *calcium hydroxide (slaked lime)*. Like Barbier, he uses *sodium carbonate* to precipitate the "total alkaloids," obtaining a "brown, granular powder." To purify the morphine, he can use *slaked lime* and a *salt*, ammonium chloride, the ingredients of the recipe of method one, of Southeast Asia.

Brutko and Utkin use ammonia as part of their process. The pH of ammonia and lime are very similar but have slightly different effects on the morphine in the opium solution. The fifth method uses hydrochloric acid, toluene, chloroform and fusel oil. But it also uses at one stage, *lime*, to precipitate meconic acid. Again, there is this combination of modern industrial solvents and simpler traditional techniques.

Ma mentions a number of alkali hydroxides or carbonates to precipitate the non-morphine alkaloids and sodium chloride as a preferred salt to prevent emulsions, so it appears certain

substitutions are possible. Ma pays particular attention to properly adjusting the pH of the solution.

For a little perspective, the Kabay process extracts the alkaloids directly from the capsules of the plant using *sodium bisulphite* and *ammonium sulphate* with benzene. The same chemicals, lime and ammonium chloride, which are used to extract morphine from opium are also used to help extract the alkaloid cocaine from coca leaf.

The previous sample of modern alkaloid extraction methods can in no way be said to be exhaustive. But many of these methods employ, at least at some stage, the general outlines of a common procedure using acids, bases and salts to extract and precipitate alkaloids. The use of lime and some kind of salt is a simpler technique that survives either alone or part of more complex methods that use highly advanced technology and industrial solvents. As will be seen later, this is partly because the techniques for extracting alkaloids from plants are very old.

Some legitimate questions can be posed at this point:

(1) Can common salt be substituted for ammonium chloride? Ma suggests it can, at least for the purpose of preventing emulsions. (2) What would happen if one added lime and salt together at the same time as Bridgman reports? (3) What would happen if one added salt first and lime later as reported by Kuo's Lin? (4) Is heating the solution essential or would enough heat be generated by throwing in "pieces of thoroughly heated limes," reproducing the exothermic reaction between unslaked lime and water? (5) Since Lin had roughly the same ingredients (water, lime and a salt), could Lin have made morphine? (6) Would he have wanted to? (7) Most of these methods want the morphine distinct from the other alkaloids so they separate and filter the liquid between stages. What would happen if they didn't? After a settling time, would the morphine in the liquid then precipitate into the sludge with the rest of the alkaloids?

Before these questions can begin to be answered, there are more clues that can be obtained from observing certain nineteenth century European techniques of alkaloid extraction.

## XIII DEROSNE

---

- XIII. DEROSNE
  - A. THE AGE OF THE ALKALOIDS
  - B. POTASSIUM CARBONATE, LIME AND DEROSNE
    - 1. FIRST EXPERIMENT
    - 2. SECOND EXPERIMENT
    - 3. THIRD EXPERIMENT
  - C. DISCUSSION

*THOUGH* modern methods for extracting alkaloids from opium still use salt and lime, Lin's work must be placed within the historical context of the early 19th century. The Commissioner soaks opium in salt and lime during a particularly interesting period. European chemists were also experimenting with opium, salt and lime, not for the ostensible purpose of destroying the opium but instead first to attempt to analyze the substance and second to extract its "active principles," which later came to be known as alkaloids.

The first part of their work centered on analysis, the careful picking apart of the different constituents of plants. Naturally, the first plants they chose were the ones with important medicinal properties. For the same reason, many of these early chemists and pharmacists chose to analyze first the popular and widely sold medicinal plant extract, opium. Three important early investigators were Derosne, Séguin and Sertuerner. All three experimented with different salts and lime.

## A. THE AGE OF THE ALKALOIDS

The first four decades of the 19th century witnessed astonishing advances in alkaloid chemistry as European chemists and pharmacists began to investigate the alkaline properties of plants, a period in the history of pharmacology that has since been called the "Age of the Alkaloids:"<sup>1</sup>

In the years between 1820 and 1840 a large number of alkaloids were isolated and purified and their properties described in the literature. Important alkaloids discovered during that period are veratrine, strychnine, piperine, berberine, coniine, atropine, codeine, thebaine, hyoscyamine, curarine, emetine, quinidine, aconitine, and colchicine.<sup>2</sup>

What these early chemists were investigating was then known as "the bitter principle."

The bitter taste of certain vegetables appears to be owing to the presence of a peculiar principle, differing from every other substance in its chemical properties. ... The affinities, which produce in living vegetables so many acids, appear also to be capable of giving rise to a variety of alkaline substances, several of which have been discovered and identified during the few last years. These vegetables are, for the most part, distinguished by very powerful effects on the animal system, ... and a few of the active principles, thus detached, have already become important instruments in the hands of the physician.<sup>3</sup>

---

<sup>1</sup> Lopez-Muñoz, Francisco and Cecilio Alamo. "*La síntesis de la morfina: del milagro de la analgesia a la maldición de las dependencias* (The Isolation of Morphine: From the miracle of analgesia to the curse of addiction)," *Redes de Investigación en Medicamentos*, Madrid Farmaindustria, 9 July 2007, p. 15; found at [www.ciberer.es/documentos/REDES%209%20BAJA.pdf](http://www.ciberer.es/documentos/REDES%209%20BAJA.pdf); originally, *Con la síntesis de la morfina a partir del opio, a principios del siglo XIX, se inició un periodo de la historia de la farmacología que ha sido denominado como 'el periodo de las alcaloides.'*

<sup>2</sup> "Alkaloids," *Encyclopaedia Britannica*. Vol. 1. A to Antarah. Chicago, IL: William Benton, 1965, p. 637.

<sup>3</sup> Henry, William. *The Elements of Experimental Chemistry*. 11th edition. Volume 2. Philadelphia, PA: Robert DeSilver, 1831, pp. 255-256 (GB).

The next question was what to call these newly isolated, by the chemical standards of the time more or less irreducible substances (principles) since the term alkali was already taken for substances like potash,<sup>4</sup> soda ash<sup>5</sup> and ammonia. These new substances were "alkalis of feeble energy"<sup>6</sup> similar to the inorganic alkalis already known but not as strong. Because they so much resembled the already known alkalis in that they formed salts with acids, Karl Frederick Wilhelm Meissner gave them the name "alkaloids" (alkali-like)<sup>7</sup> in 1818 (*italics added*):

---

<sup>4</sup> "The ash of trees consists chiefly of potash. ... (It is made from) the ashes of wood, consumed as a fuel (which) is lixiviated with water, which dissolves the soluble matter; this liquor is then evaporated in a pot until a solid saline mass, of a brown colour, is obtained, which is hence called in commerce *pot-ashes* ... or *pearl-ash*." - John Sproule (1854), p. 105 (GB). "(T)he process termed 'lixiviation' is adopted. This consists in dissolving the salt with water, and so getting rid of the earthly impurities, when the brine is treated as usual." - Huskisson (1853), p. 426 (GB).

<sup>5</sup> Soda ash (predominantly sodium carbonate,  $\text{Na}_2\text{CO}_3$ ) is an alkali that differs from potash (mostly potassium carbonate,  $\text{K}_2\text{CO}_3$ ) originally by its source: "The term (alkali) was originally applied to the ashes of plants from which the carbonates of sodium and potassium were lixiviated or leached. The conversion of these 'mild' alkalis into 'caustic' alkalis by treatment with lime was practised in Pliny's time and was utilized in the manufacture of soap, the ashes of sea plants yielding a hard soap and those of land plants a soft one. The distinction between the two components of this fixed alkali was made by the French chemist, Henri Louis Duhamel du Monceau, who in 1736 established that the ashes of sea plants contain the same base as is found in natural deposits of sodium salts or mineral alkali, and that this substance was different from the vegetable alkali obtained from the ashes of land plants (potashes). Later, Martin Heinrich Klaproth, who found the vegetable alkali in certain minerals, proposed the name potash. The symbol for potassium, K, was taken from the modernized Latin word *kalium* (from the Arabic word for 'calcined')." - J. B. Ps. "Alkali," *Encyclopaedia Britannica*, 1965, vol. 1, p. 636.

<sup>6</sup> Henry, p. 257 (GB).

<sup>7</sup> Schiff, Paul L. "Opium and its Alkaloids," *American Journal of Pharmaceutical Education*, Summer 2002, p. 7, found at [http://findarticles.com/p/articles/mi\\_qa3833/is\\_200207/ai\\_n9107282](http://findarticles.com/p/articles/mi_qa3833/is_200207/ai_n9107282).

It is chiefly from their habitudes of chemical combination, that these new substances are classified among alkalis, which they resemble in the power of neutralizing acids, and of affording with them compounds analogous to the salts, which result from the union of acids with the alkaline substances that have been known. They have all, however, weaker affinities for acids, than belong to alkalis of the latter class: their powers of neutralizing acids are extremely feeble, and their equivalent numbers consequently very high. Hence they have been termed, not improperly, by some chemists, *alkaloids*.<sup>8</sup>

The first alkaloid extracted and isolated in this era is generally credited as having been morphine obtained from the juice of *Papaver somniferum* L. "Morphine is a molecule that can lay claim to being the original alkaloid and the first true drug,"<sup>9</sup> writes Michael Freemantle. Though it is often reported in this manner, the first alkaloid could well have been not morphine but narcotine which may have been extracted and roughly isolated first:

The first reported attempt to isolate an alkaloid dates back to 1803 when Charles Derosne observed that a sirupy extract of opium when diluted with water, deposited crystalline matter, which he separated and tried to purify and so prepared the first alkaloid, probably impure narcotine.<sup>10</sup>

Even so, much kudos is rightly given to the early developments in the extraction of morphine:

The morphine story is one of the most enthralling in all of science .... Early attempts to unlock the mysteries of opium provided a major stimulus to the development of organic chemistry and, it may be argued, spawned the entire field of medicinal chemistry.<sup>11</sup>

---

<sup>8</sup> Henry, pp. 256-257 (GB).

<sup>9</sup> Freemantle, Michael. "Morphine," *Chemical and Engineering News*, Vol. 83, Issue 25 (6/20/05) who quotes "assistant professor Paul R. Blakemore and professor emeritus James D. White at Oregon State University, Corvallis (*Chem. Commun.* 2002, 1159)," p. 1; found at <http://pubs.acs.org>.

<sup>10</sup> "Alkaloids," *Encyclopaedia Britannica*. Vol. 1. Chicago, IL: William Benton, 1965, p. 637.

<sup>11</sup> Freemantle, p. 2, again quoting Blakemore and White.

For its initial extraction and isolation many of the pioneering 19th century chemists and pharmacists used little more than simple solvents, acids, strong bases and salts to extract morphine and several other alkaloids from opium and *Papaver somniferum* (as well as the alkaloids from other plants). Their purpose initially was not so much production but analysis. Some of their methods used lime and salt.

## B. POTASSIUM CARBONATE, LIME AND DEROSNE

Jean-Francois Derosne (1774-1855)<sup>12</sup> was the owner of a well-known pharmacy at 115 St. Honoré street in Paris. He later became a member of the *Academie Royale de Medecine* and was twice elected President of the *Societe de Pharmacie* de Paris.<sup>13</sup> Derosne was only one of many other researchers who were experimenting with plant alkaloids around the beginning of the 19th century. In the words of the great French chemist Robiquet, "Opium is perhaps of all these substances, that which has been submitted to the greatest number of experiments."<sup>14</sup> Yet:

[i]n spite of the work of many distinguished and knowledgeable investigators, such as Neumann, Medelius, Hoffman, Baumé, Josse, Proust, etc., little progress was found in the chemical analysis of opium until M. Derosne undertook a more complete work, above all in recognizing well the particular

---

<sup>12</sup> See for the dates, [www.didier-pol.net/8morph&h.htm](http://www.didier-pol.net/8morph&h.htm), [www.poncepilateagain.com/index.php?pr=opio\\_3](http://www.poncepilateagain.com/index.php?pr=opio_3), and [www.med.univ-angers.fr/disciplines/bio\\_cel/M1%20TVPS%20et%20BVI/cours.ppt](http://www.med.univ-angers.fr/disciplines/bio_cel/M1%20TVPS%20et%20BVI/cours.ppt). The latter has an excellent discussion of the alkaloids.

<sup>13</sup> Flahaut, J. "The Derosne, Parisian pharmacists from 1779 to 1855," *Revue d'histoire de la pharmacie*, (Paris) 2005 Jan; 53 (346), pp. 221-234, found at [www.unboundmedline.com](http://www.unboundmedline.com).

<sup>14</sup> Robiquet, P. J. "Observations sur le Mémoire de M. Sertuerner, relatif à l'analyse de l'Opium," *Annales de Chimie et de Physique*. Vol. 5. Paris: Chez Crochard, 1817, pp. 275-276 (GB). Originally, *L'opium est peut-être de toutes ces substances, celle qui a été soumise à un plus grand nombre d'expériences*.



substance that he had reported, which was considered as an acid by some and as a muddy salt by others.<sup>15</sup>

Derosne's experiments have been reported by a number of different authors and their stories of what he did can be compared with one another. Professors Lopez-Muñoz and Alamo (2007) of the Department of Pharmacology at the University of Alcalá in Madrid tell one version of what Derosne did (*italics added*):

Upon treating a solution of opium with *calcium carbonate*, he obtained a crystalline salt that was more active than the original opium. Chemical analyses realized by Derosne confirmed that this salt possessed alkaline properties, attributed by the author to the contamination by the potassium used for the precipitation.<sup>16</sup>

Drews (2003) states that Derosne wrote a letter to the *Société de Pharmacie* in which he reported that he had

isolated a crystalline salt in the course of developing a new analytical test for determining the presence of opium. Derosne could not say much about the

---

<sup>15</sup> Boullay, P.-F.-G. "Extrait du mémoire de M. Sertuerner sur l'analyse de l'opium, sur la morphine et l'acide meconique; et observations de M. Robiquet sur le même sujet," *Journal de Pharmacie et des sciences accessoires*, vol. 3. E.-J.-B. Bouillon La Grange, et al, editors. Paris: Chez L. Colas, 1817, p. 446 (GB); originally, *Malgré les travaux de plusieurs savans distingués, tels que Neumann, Wedelius, Hoffman, Baumé, Josse, Proust, etc., l'analyse chimique de l'opium se trouvait peu avancée, lorsque M. Derosne entreprit d'en faire une plus complète, et surtout de bien reconnaître la substance particulière qu'on y avait annoncée, et qui était regardée comme un acide par les uns, et comme un sel terreux par les autres.*

<sup>16</sup> Lopez-Muñoz, Francisco and Cecilio Alamo. "La síntesis de la morfina: del milagro de la analgesia a la maldición de las dependencias (The Isolation of Morphine: from the miracle of analgesia to the curse of addiction)," *Redes de Investigación en Medicamentos*, Madrid Farmaindustria, 9 July 2007, p. 15; found at [www.ciberer.es/documentos/REDES%209%20BAJA.pdf](http://www.ciberer.es/documentos/REDES%209%20BAJA.pdf); originally, *que al tratar una disolución de opio con carbonato cálcico obtuvo una sal cristalina más activa que el propio opio. Los análisis químicos realizadas por Derosne confirmaron que esta sal poseía propiedades alcalinas, atribuidas por el autor a una contaminación por la potasa utilizada para la precipitación.*

nature of his crystals. He believed that he could only exclude the possibility that the new component was a plant acid.<sup>17</sup>

Small (1931) reported Derosne's results this way (*italics added*):

In 1803 Derosne, by extraction of opium with water and *precipitation of the extract with potassium carbonate*, obtained a crystalline substance which he named 'salt of opium.' He observed its solubility in acids and precipitation by bases, but failed to recognize its basic character.<sup>18</sup>

Henry (1831) observed Derosne's work from the viewpoint of the ongoing developments in alkaloid extraction:

Opium and other vegetable products possessed of narcotic power, are composed of several of the vegetable principles that have already been enumerated. Besides these, however, they contain a peculiar one, in which the narcotic virtue resides. It was first extracted from opium by Derosne, in 1803 (*Annales de Chimie*, vol. xlv), but his process has been superseded by others, better adapted to afford the narcotic principle in a state of purity.<sup>19</sup>

In 1819, however, Henry's Elements of Chemistry gives this version of Derosne's method and what he obtained:

To obtain the narcotic principle from opium by the process of Derosne, let water be digested upon it, and the strained solution be evaporated to the consistence of syrup. A gritty precipitate will begin to appear, which is considerably increased by diluting the liquid with water. This consists of three distinct substances, resin, oxygenized extract, and the narcotic principle. Boiling alcohol dissolves the resin and the narcotic principle only; the latter falls down in crystals, as the solution cools; still, however, coloured with resin. The crystals may be purified by repeated solutions and crystallizations. The narcotic principle, thus obtained, is white. It crystallizes in rectangular

---

<sup>17</sup> Drews, Jurgen. In Quest of Tomorrow's Medicines. New York: Springer-Verlag, 2003, p. 33 (GB).

<sup>18</sup> Small, Lyndon F. Chemistry of the Opium Alkaloids. Supplement No. 103 to the Public Health Reports, U. S. Treasury Department, Public Health Service. Washington, D. C.: USGS Printing Office, 1932, p. 138.

<sup>19</sup> Henry (1831), p. 257 (GB).

prisms with rhomboidal bases. It is destitute of taste and smell. ... It is soluble in acids, and precipitated by alkalis.<sup>20</sup>

In 1817, Boullay reported the method of Derosne in an article in the *Journal de Pharmacie*:

M. Derosne treated the opium of commerce with cold distilled water. The solution he obtained was evaporated to the consistency of a syrup. Upon cooling, this then gave him some crystals of a dark brown color, then an abundant deposit with the aid of an added quantity of water, and finally a second deposit after a new concentration of the floating liquor and a new addition of water. He treated the marc of this opium purified by the water with hot alcohol. This resulted in a strongly red-colored tincture, from which after cooling a thick, oily matter was separated. Then, having distilled from this tincture its alcohol, the opium resin was found precipitated. Finally, after evaporating the watery residue, he collected some flakes of a yellow salt. The flakes, deposits and crystals, products of the two previous operations were submitted to repeated dissolutions and recrystallizations. They were cleared of the resin and the coloring matter and gave him the highest degree of purity of the substance which was the principal object of his research and which he named the essential salt of opium, until a more appropriate name could be found.<sup>21</sup>

---

<sup>20</sup> Henry, William. *The Elements of Experimental Chemistry*. The first American from the eighth London edition. Vol. 2. Philadelphia, PA: Robert DeSilver, 1819, p. 193 (GB).

<sup>21</sup> Boullay (1817), p. 437 (GB); originally, *M. Derosne a traité à froid l'opium du commerce par l'eau distillée; il a évaporé en consistance de sirop la solution obtenue, qui alors lui a donné, par refroidissement, des cristaux d'une couleur brune foncée, puis un dépôt abondant à l'aide d'une quantité d'eau ajoutée, et enfin un second dépôt après une nouvelle concentration de la liqueur surnageante, et une nouvelle addition d'eau. Il a traité à chaud, par l'alcool, le marc de cet opium épuisé par l'eau; il en est résulté une teinture fortement colorée en rouge, de laquelle s'est séparée, par refroidissement, une matière; puis, ayant enlevé à cette teinture, au moyen de la distillation, sa partie spiritueuse, la résine de l'opium s'est trouvée précipitée; ensuite, faisant évaporer le résidu aqueux, il a recueilli des flocons d'un jaune sale. Il a soumis à des dissolutions et à des cristallisations répétées, dans l'alcool, les flocons, les dépôts, les cristaux, produits des deux opérations précédentes: ils se sont débarrassés de la résine et de l'extractif qui les coloraient, et lui on fourni dans le plus haut degré de pureté la substance qui était le principal*

Boullay (1817) says Derosne described his new essential salt of opium this way:

This salt, according to M. Derosne, is white. It crystallizes in straight prisms with a rhomboidal base, often bunched together in small tufts. It is tasteless, has no odor, insoluble in cold water, soluble in four hundred parts of alcohol when brought to a degree of boiling. This last solution, if water is added, becomes white and opaque. This salt also dissolves in ether, in volatile oils, but above all very easily and quickly in liquid acids, from which it is separated by the alkalis in the form of a white powder. ... Finally, this salt was proved on some animals to which one administered a small quantity, causing the effects of taking a strong dose of opium.<sup>22</sup>

According to Boullay (1817), Derosne also experimented with an alkali precipitation of his new salt:

M. Proust regarded the abundant precipitate that the alkalis formed with a cold solution of opium as a pure resin. This precipitate washed, then submitted to the repeated action of boiling alcohol, furnished M. Derosne with a very pure salt, which differed from the previous in that it has a slightly bitter taste, it crystallizes less regularly, it is a little more soluble in water.<sup>23</sup>

---

*objet de ses recherches, et à laquelle il a donné le nom de sel essentiel d'opium, en attendant qu'on lui en ait trouvé un plus convenable.*

<sup>22</sup> Boullay (1817), pp. 437-438 (GB); originally, *Ce sel, suivant M. Derosne, est blanc: il cristallise en prismes droits à base rhomboïdale, souvent réunis en petites houppes; il est insipide, inodore, insoluble dans l'eau froide, soluble dans quatre cents parties d'alcool amené aussi au degré d'ébullition; cette dernière dissolution, si on l'étend d'eau, devient blanche et opaque. Ce sel se dissout encore dans l'éther, dans les huiles volatiles, mais surtout très-facilement et très-promptement dans les acides liquides, desquels il est séparé par les alcalis sous la forme d'une poudre blanche. ... Ce sel enfin fait éprouver aux animaux auxquels on l'administre en petite quantité, les accidens que leur occasionerait l'opium pris à forte dose.*

<sup>23</sup> Boullay (1817), p. 438 (GB); originally, *M. Proust avait regardé comme une résine pure le précipité abondant que forment les alcalis dans une dissolution d'opium faite à froid. Ce précipité lavé, puis soumis à l'action réitérée de d'alcool bouillant, a fourni à M. Derosne un sel très-pur, qui diffère du précédent en ce qu'il a une saveur légèrement amère, qu'il cristallise moins régulièrement; qu'il a un peu plus de solubilité dans l'eau ....*

These 19th, 20th and 21st century second hand accounts of Derosne's experiments tend to conflict on a number of basic points, no doubt because they ignore some details while concentrating on others. Because of these conflicts, it is useful to return to the original to examine precisely what Derosne did and did not do.

## 1. FIRST EXPERIMENT

Derosne's work was reported in a paper entitled *Memoire Sur l'Opium* published in the *Annales de Chimie*, volume 45, pages 257-285. Derosne actually reported three basic experiments with opium, the first with cold water, the second with alcohol and the third with potassium carbonate which may help explain the different stories.

After spending several pages reviewing the conflicting results of experiments by Neumann, Wedelius, Hoffmann, Tralles (Trulles), Baumé, Josse, Proust, and Payssé, Derosne says that he began the basic extraction of his first experiment using simply cold water (*italics added*):

I poured upon on a kilogram of the opium of commerce, crushed, *ten times its weight of distilled water* and I stirred the mixture from time to time. *At the end of two days I decanted the solution which was perfectly clear and lucid* and I poured again several times water upon the marc [residue] in order to remove all of the extractable material. The marc was well squeezed between the hands and then placed in digestion with alcohol to be examined separately. The solutions of the extracts were combined and filtered.<sup>24</sup>

---

<sup>24</sup> Derosne, "Memoir sur l'Opium," *Annales de Chimie*, vol. 45 (1803). Paris: Chez Crochard, 1803, pp. 260-261 (UM). Originally, *Je versai sur un kilogramme d'opium du commerce concassé, dix fois son poids d'eau distillée, et j'agitai le mélange de temps en temps. Au bout de deux jours je décantai la dissolution qui était parfaitement claire et limpide, et je versai encore à plusieurs reprises de l'eau sur le marc pour en enlever toute le manière extractive. Le marc fut bien exprimé entre les mains, et mis de suite en digestion avec de l'alcool pour etre examiné séparément. Les dissolutions extractives furent réunies et filtrées.*

By simply soaking the opium in cold water and allowing it to rest for two days, Derosne divides the opium into two parts: a clear, watery solution and a marc or residue.

He decants the solution, washes the residue and combines all of the liquids. Williams (1857) describes the process of decanting this way in his handbook:

[S]ometimes it is considered preferable to wash the precipitate by the process called *decantation*, which consists in adding a considerable quantity of water to it in some convenient vessel (preferably a tall and narrow one), and, after thorough incorporation of the washing fluid and the precipitate by stirring, it is allowed to settle until the whole of the solid matter has been deposited; the fluid is then poured off, and the operation repeated until the precipitate is sufficiently washed, the latter point being ascertained in all cases by testing.<sup>25</sup>

Derosne has divided his opium into a soluble part in the extractive solutions and the other insoluble part in the marc.

Derosne next performs various tests both on the original opium and water solution as well as upon his combined extractive solutions (extracts) with the marc removed (*italics added*):

The solution of opium as those of the majority of the extracts turn red the *tincture of Tournesol* and do not at all redden that of *tincture of violets*. The *caustic alkalis and carbonates*, the waters of *lime* and *baryta*<sup>26</sup> cause an *abundant precipitate*. These precipitates redissolve completely in acids with the exception of that of the *baryta*, of which one portion remains insoluble. Oxalic acid also makes a precipitate but considerably less than the previous

<sup>25</sup> Williams (1857), p. 137 (GB).

<sup>26</sup> Baryta is not the metal barium but barium oxide: "In 1774 Carl Wilhelm Scheele, the Swedish chemist who discovered oxygen, found that the mineral called heavy spar or *barys* (Greek: heavy) contained a new earth, which became known as baryta (barium oxide)." - from "alkaline-earth metal" in *Encyclopaedia Britannica*. 2007. Encyclopaedia Britannica Online. 1 Dec. 2007, <http://search.eb.com/eb/article-9110606>. From the earth baryta Sir Humphrey Davy isolated the metal barium in 1808 by electrolytic methods: "From indirect experiments Sir. H. Davy was inclined to consider baryta as composed of 89.7 barium and 10.3 oxygen." - from Andrew Ure's *A Dictionary of Chemistry and Mineralogy*. 4th edition. London: Thomas Tegg, 1831, p. 198 (GB) and EB online.

substances. The other acids do not cloud the solution; they even seem to clarify it. Lead acetate makes a very heavy precipitation as it does with all the vegetable solutions; silver nitrate does not make one, at least not immediately. The presence of sulfate of *lime* in the solution of opium is demonstrated by the baryta and the oxalic acid; but the quantity of calcerous oxalate is much less than that of the baryta obtained, a fact that presumes the sulfuric acid in this liquid is more united to another base than the *lime*. *I will examine hereafter more in detail the precipitate that the alkalis produce on the solution*, because they present an exact enough method for analyzing that substance.<sup>27</sup>

A nineteenth century chemistry handbook explains what chemists meant by obtaining a precipitate (*italics added*):

Precipitation is one of the most valuable processes for separating substances from each other, and is perhaps the most frequently used in research. *It depends upon the conversion of substances from a soluble to an insoluble state*, with reference to the menstruum employed. When a substance in solution has a reagent added to it which contains a body capable of forming with it a comparatively insoluble compound, *the latter falls to the bottom of*

---

<sup>27</sup> Derosne, *Memoir sur l'Opium*, *Annales de Chimie*, vol. 45, (1803), pp. 261-262 (UM). Originally, *La dissolution d'opium comme celles de la plupart des extraits, rougit la teinture de Tournesol, elle ne rougit point celle de violettes. Les alcalis caustiques et carbonates, les eaux de chaux et de baryte y font un précipité abondant. Ces précipités se redissolvent en entier dans les acides, à l'exception de celui forme par la baryte, dont une portion reste insoluble. L'acide oxalique y fait aussi un précipité, mais moins considérable que les précédens. Les autres acides ne troublent par la dissolution, ils semblent meme l'éclaircir. L'acétite de plomb y fait un précipité très-épais, comme cela lui arriver avec toutes les dissolutions végétales; le nitrate d'argent n'y en occasionne pas, au moins instantanément. La présence du sulfate de chaux dans la dissolution d'opium est démontrée par la baryte et l'acide oxalique; mais la quantité d'oxalate calcaire beaucoup moindre que celle du baryte obtenue, fait présumer que l'acide sulfurique dans ce liquide est encore uni à une autre base qu'à la chaux. J'examinerai ci-après plus en détail le précipité que les alcalis produisent dans la dissolution, parce qu'ils présentent des moyens assez exacts pour l'analyse de cette substance.*

*the liquid* with different degrees of readiness, depending upon its state of density, aggregation, or insolubility, and is then said to be precipitated.<sup>28</sup>

Precipitates do not have to fall to be precipitated (*italics added*):

It sometimes happens, although the matter previously in solution becomes insoluble and separates, that, from its want of density, *it floats or remains suspended*; nevertheless, by a convenient expression, it is generally said to be precipitated.<sup>29</sup>

In Derosne's first experiment, he dilutes the opium ten times by weight so his solution is quite thin. According to Williams' 1857 handbook, this dilution has certain advantages (*italics added*):

When the solution to which the precipitant has been added is dilute, it is generally easy to ascertain the completion of the process, *because the precipitate falling leaves a portion of the liquid clear*, so that the action is easily controlled ....<sup>30</sup>

Tournesol, or turnsol, was an early name for litmus, also known as *archil* or *orchell*. Bigelow's 1829 Elements of Technology offers this description:

The dye called *archil*, is obtained from a kind of lichen, (lichen roccella) which grows chiefly in the Canary Islands, and is employed by the Dutch in forming the blue pigment called *litmus* or *turnsol*.<sup>31</sup>

Smith's 1844 Botany expands on the story:

Orchell is, perhaps, more generally known by the names of Litmus or Turnsol, under which terms it was originally brought to market by the Florentines, and afterwards by the Dutch, while its preparation was yet a secret from the rest

---

<sup>28</sup> Williams, C. Greville. A Handbook of Chemical Manipulation. London: John Van Voorst, 1857, p. 124 (GB).

<sup>29</sup> Williams (1857), p. 124 (GB).

<sup>30</sup> Williams (1857), p. 126 (GB).

<sup>31</sup> Bigelow, Jacob. Elements of Technology. Boston, MA: Hillard, Gray, Little and Wilkins, 1829, p. 442 (GB).



of the European nations. ... The best is imported from the Canary and Cape Verd Islands ....<sup>32</sup>

Litmus was used then in much the same way it would be used in high school chemistry labs two hundred years later: "Litmus or Turnsol. A blue pigment obtained from the Lichen *Orcella*. ... Litmus is employed by chemists for detecting the presence of a free acid."<sup>33</sup> Tincture of violets is still used as a substitute litmus test for home chemists: "You can make a homemade litmus solution by filling a jar with violet flowers and boiling water. Strain after steeping it overnight. Acid turns it purple/red and base turns it yellow/green. Use it to test whether your bilberry plant's soil needs acidifying."<sup>34</sup> This property was well known in the 19th century: "The colouring matter of the violet is blue, but is changed by acids to red."<sup>35</sup>

Dumas *père* has Dr. d'Avrigny explain both tests to the magistrate de Villefort in the case of the poisoned lemonade:

There is a poison which destroys life almost without leaving any perceptible traces. I know it well; I have studied it in all its qualities and in the effects which it produces. I recognized the presence of this poison in the case of poor Barrois as well as in that of Madame de Saint-Méran. There is a way of detecting its presence. It restores the blue color of litmus-paper reddened by an acid, and it turns the syrup of violets green. We have no litmus-paper, but, hark! here they come with the syrup of violets.<sup>36</sup>

Why does Derosne's solution test acid by the litmus test and not by his tincture of violets? By the first test he has a free acid and by the second a neutral solution: "The neutral state of salts is

---

<sup>32</sup> Smith, James Edward. English Botany. 2nd edition. Vol. XI. London: Judith Sowerby, 1844, p. 62 (GB).

<sup>33</sup> Hoblyn, Richard D. A Dictionary of Terms used in Medicine and the Collateral Sciences. Philadelphia, PA: Blanchard and Lea, 1856, p. 258 (GB).

<sup>34</sup> [www.henriettesherbal.com/articles/viola.html](http://www.henriettesherbal.com/articles/viola.html).

<sup>35</sup> Thomson, Thomas. Annals of Philosophy. Vol. XIII. London: Baldwin, Cradock, and Joy, 1819, p. lxxvi (GB).

<sup>36</sup> Dumas, Alexandre. The Count of Monte-Cristo. Vol. II. London: Chapman and Hall, 1846, p. 214 (GB).

commonly indicated by their solutions not changing the colors of litmus, violets, or red cabbage."<sup>37</sup> If both tests were employed equally, one would think if it reddened the first, it should redden the second.

Although these tests were commonly used by early chemists as convenient analytical tools, there was nothing pure about either the products or their equipment. The syrup of violets was especially a problem:

The sirop of violets is not easily obtained pure. ... When it can be procured genuine, sirop of violets is an excellent test of acids, and may be employed in the same manner as infusion of litmus. It indicates, also, the presence of alkalis, which turn it green.<sup>38</sup>

But then, litmus had its problems also: "Impurities - Inferior samples of litmus (including all those usually found in English commerce) contain indigo ...."<sup>39</sup> Sometimes glassware would leach substances into the solutions:

If to an alkalimetric solution tinted with litmus, sufficient standard acid be added to impart a red colour to the litmus, and the solution be then boiled for a few moments in a Bohemian glass vessel, sufficient alkali is dissolved out to restore the blue colour of the litmus ... the longer the boiling is continued, the greater is the error introduced. ... French glass vessels having a soda base are not thus attacked.<sup>40</sup>

Beyond the problem of contamination, certain resins would show just this phenomenon, of coloring the one and not the other:

---

<sup>37</sup> Ure, Andrew. A Dictionary of Arts, Manufactures, and Mines. Vol. II. New York: D. Appleton and Company, 1856, p. 575 (GB).

<sup>38</sup> Henry, William. Elements of Experimental Chemistry. 11th edition. Vol. II. Philadelphia, PA: Robert DeSilver, 1831, p. 427 (GB).

<sup>39</sup> Perreira, Jonathan. The Elements of Materia Medica and Therapeutics. Third American edition. Vol. II. Philadelphia, PA: Blanchard and Lea, 1854, p. 77 (GB).

<sup>40</sup> Truchot, P. "On Errors arising from the Use of Bohemian Glass Vessels in Chemical Analysis, especially in Alkalimetry," *J. Chem. Soc.* 1875, 28: 381-385, [www.rsc.org/publishing/journals/article.asp?doi=js8752800381](http://www.rsc.org/publishing/journals/article.asp?doi=js8752800381).

The filtered liquid [of sandarach] remains clear; and, when evaporated to a certain point, slightly reddens tincture of litmus; its taste is bitter; it does not alter infusion of violets; it is not precipitated by alcohol or acetate of lead, which shows, that it contains neither gum nor extract. It is therefore a pure resin. The resin thus treated with boiling water was dissolved in alcohol. This tincture strongly reddened that of litmus, and had no action on sirup of violets.<sup>41</sup>

So would arsenic acid: "If arsenic acid be added to the preceeding salt, till it ceases to have any effects on the sirup of violets, it will redden the solution of litmus."<sup>42</sup> Phlogisticated nitrous acid gave completely contrary results:

I have observed that litmus is no test of the saturation of this acid by alkalies; for the infusion of litmus added to such a mixture will turn red, when the liquor appears to be highly alkaline, by its turning the infusion of violets, rose leaves, and most other red juices, green.<sup>43</sup>

Finally, each test had its limitations. Syrup of violets had been the standard test before the introduction of litmus:

The syrup of violets was formerly the test of the point of saturation of mixtures of acids and alkalies, which was principally used; but since the late improvements in chemistry it has been found not to be sufficiently accurate, and the infusion of tournesol, or of an artificial preparation called litmus, have been substituted in the place of it.<sup>44</sup>

---

<sup>41</sup> Bouillon-LaGrange and Vogel. "An analytical Essay on the Scammonies of Aleppo and Smyrna, with some Observations on the reddening of Litmus by Resins," in *A Journal of Natural Philosophy, Chemistry and the Arts*. Vol. XXVII. William Nicholson, editor. London: W. Nicholson, 1810, p. 315 (GB).

<sup>42</sup> Ure, Andrew. *A Dictionary of Chemistry on the basis of Mr. Nicholson's*. First American edition. Vol. I. Philadelphia, PA: Robert DeSilver, 1821, no page numbering, see article entitled "Acid (Arsenic)" under "ACI," (GB).

<sup>43</sup> Watt, James. "Sequel to the thoughts on the constituent parts of water and dephlogisticated air," in a letter dated 30 April 1784 from Correspondence of the late James Watt. Muirhead, J. P., editor. London: John Murray, 1846, p. 109 (GB).

<sup>44</sup> Watt, James. "On a new Method of preparing a Test Liquor to Shew the Presence of Acids and Alkalies in Chemical Mixtures," The Annual Register,

But the tincture of violets had certain advantages that litmus did not:

The lichen-blue is an aqueous infusion of litmus, is distinguished from other vegetable blues by the action of acids and alkalies on it (see *supra*); for most vegetable blues and purples (as red cabbage juice, syrup of violets, &c.) are changed to green by alkalies, whereas, lichen-blue does not undergo this change.<sup>45</sup>

As a result, these two tests were not necessarily used interchangeably. Litmus was better at indicating acids and tincture of violets better at indicating bases:

Litmus. The purple of litmus is turned to red by every acid; so that this is the test generally made use of to detect the excess of acid in every fluid. ... Litmus already reddened by an acid, will have its purple restored by an alkali; and thus it may also be used as a test for alkalies, but it is much less active than other direct alkaline tests. ... Violets. The delicate blue of the common scented violet is readily changed to green by the alkalies, and this affords a delicate test for these substances. Syrup of violets is generally used as it is at hand, being used in medicine. But a tincture of the flower will answer as well.<sup>46</sup>

Derosne is evidently aware of these limitations. He uses his tests within this context. He tests his solutions with "Tincture of Tournesol" to detect the presence of an acid: "As the solution of opium in its natural state reddens the tincture of Tournesol, and that this property presumes the existence of an acid ...."<sup>47</sup> His test

---

or a view of history, politics and Literature for the years 1784 and 1785.

Second edition. London: Proprietors of Dodsley's Annual Register, et al., 1800, p. 27 of the section entitled "Characters," (GB).

<sup>45</sup> Perreira (1854), p. 77 (GB).

<sup>46</sup> Pilkington, James. *The Artist's Guide and Mechanic's Own Book*. Boston, MA: Lanborn, Carter and Bazen, 1856, p. 38 (GB).

<sup>47</sup> Derosne (1803), p. 270 (UM). Originally, *Comme la dissolution d'opium dans son état naturel rougit la teinture de Tournesol, et que cette propriété y fait présumer l'existence d'un acide ...*

with violets simply establishes that the initial solutions are not base.

At this point in his first experiment, Derosne has separated his opium into a liquid (the extractive solution) and a residue (the precipitate or marc) using only cold water. He has tested the original solution and the extractive solution and found them to show the presence of a free acid. He also tests the solution with lime which makes a precipitate. Since lime is base and the solution acid, it forms salts, some of which are insoluble and precipitate. He is using lime to analyze the solution but he doesn't further discuss the precipitate he obtains with it. He pays special attention to the fact that either "the caustic alkalis or carbonates made an abundant precipitation in the solution of opium."<sup>48</sup> In general, he can use many different reagents to obtain precipitation from his solutions. What is going to be in each of these various precipitates is a separate issue.

He slowly reduces his extractive solution by evaporating the water with a gentle heat until he has a thin syrup (*italics added*):

Up until then, it offered nothing in particular: it only made a light resinous deposit. But having allowed it to cool in this state, I remarked that it had a grainy aspect, which announced evidently *the presence of a salt* which had been in solution in the liquor.<sup>49</sup>

After repeated redilutions with water and successive evaporations, he collects together the brown precipitates on a filter which on first sight were not so interesting (*italics added*): "[B]ut upon examining it more attentively, I was able to distinguish *an infinity of small*

---

<sup>48</sup> Derosne (1803), p. 268 (UM). Originally, *Nous avons dit que les alcalis caustiques ou carbonatés faisaient un précipité abondant dans la dissolution d'opium.*

<sup>49</sup> Derosne (1803), p. 263 (UM). Originally, *Jusque là, elle n'avait offert rien de particulier; il s'y était seulement fait un léger dépôt résineux. Mais l'ayant laissé refroidir en cet état, je remarquai qu'elle avait un aspect grenu, qui annonçait évidemment la présence d'un sel qui n'était plus en dissolution dans la liqueur.*

*shiny crystals* ....<sup>50</sup> He tries boiling water on his precipitate and observes some shiny, satiny reddish flakes (*flocons rougeâtres ... brillans y satinés*)<sup>51</sup> that he captures with a filter. Finally, he tried boiling alcohol on these flakes; as it cooled, it deposited very many crystals colored by the resin (*beaucoup de cristaux colorés par la résine*).<sup>52</sup>

The crystals in the precipitate are what the early 19th century analytical chemists were hoping to obtain. Williams (1857) describes the process:

The process of crystallization is one of the most important in the whole range of chemical operations, and, to perform successfully, requires considerable attention to minute detail. It is by means of it that most inorganic and organic substances are obtained in a state of sufficient purity for analysis; and it is this circumstance that makes it so great a source of pleasure to the chemist to find the substances he is investigating capable of being procured in well-defined crystals. ... Moreover, the forms of crystals are a most valuable means of identifying substances ....<sup>53</sup>

Like precipitation generally, crystallization

is dependent upon the change from the fluid to the solid state, and it is the mobility among the particles conferred by fluidity that, enabling the forces to act freely, causes bodies to assume the crystalline form.<sup>54</sup>

Whatever the deficiencies in this theory of crystallization, Williams is well aware that while useful in analysis, crystals "are not necessarily identical in composition because they are so in shape."<sup>55</sup> Robiquet will later point out that the crystals of morphine and narcotine are often mistaken for one another.

---

<sup>50</sup> Derosne (1803), p. 263 (UM). Originally, *mais en l'examinant plus attentivement, je distinguai une infinité de petits cristaux brillans, ...*

<sup>51</sup> Derosne (1803), p. 264 (UM).

<sup>52</sup> Derosne (1803), p. 264 (UM).

<sup>53</sup> Williams (1857), p. 250 (GB).

<sup>54</sup> Williams (1857), pp. 251-252 (GB).

<sup>55</sup> Williams (1857), p. 253 (GB).

Most important, Williams knows how to obtain them using many different ingenious methods, one of the simplest being evaporation (*italics added*):

It is difficult to lay down any general rule for obtaining crystals; that which is generally given in books, namely to evaporate the solution requiring to be crystallized until a *pellicle* forms and then set aside, is, it is true, adapted for most cases which occur in rough technical operations.<sup>56</sup>

A pellicle is a "thin skin or film, such as an organic membrane or liquid film."<sup>57</sup> The production of a pellicle was common in the manufacture of salt from sea water by evaporation (*italics added*):

When the water is sufficiently concentrated by the evaporation, a *pellicle forms on the surface, which is the crystallization of salt*. This falls to the bottom, and another pellicle forms, till the whole of the salt is crystallized.<sup>58</sup>

There is some slight comparison here to the formation of hail.

## 2. SECOND EXPERIMENT

Derosne does his second experiment with the marc or insoluble residue from the solution of opium and cold water which had been put aside earlier (*italics added*):

I placed a part of it to digest with six parts of alcohol at a heat of between 35 and 40 [degrees centigrade]; I obtained a tincture of a dark reddish color that I filtered while still hot, and which soon furnished some crystals colored with a lot of resin.<sup>59</sup>

---

<sup>56</sup> Williams (1857), p. 250 (GB).

<sup>57</sup> <http://encarta.msn.com>, <http://meriam-webster.com/medical/pellicle>, and [www.thefreedictionary.com/pellicles](http://www.thefreedictionary.com/pellicles).

<sup>58</sup> *Encyclopaedia Britannica, or a Dictionary of Arts, Sciences and Miscellaneous Literature*. Sixth edition. Vol. V. Edinburgh: Archibald Constable and Company, 1823, p. 569 (GB).

<sup>59</sup> Derosne (1803), p. 271 (UM). Originally, *J'en mis une partie en digestion avec six parties d'alcool à une chaleur de 35 à 40 [degrées]; j'obtins une*

After purification with boiling alcohol, this second salt precipitated as the solution of alcohol and marc cooled.

Another method of getting salts to crystallize is to change the temperature of the solvent, as some are more soluble warm than cold. Others do not have this property: "Some salts are almost equally soluble in hot and cold water ... formiate of lime and chloride of sodium are perhaps the most familiar examles of this kind of salt."<sup>60</sup>

Derosne reports that the salt he had obtained from his extractive solutions in the first experiment and the salt obtained from the marc in the second experiment are the same salt: "One part of the salt and the resin is carried over in the extractive matter, the other remains undissolved in the marc."<sup>61</sup>

How much of this salt will be in the solution and how much in the residue will depend upon the proportions of opium to cold water used during the original separation:

But, as I remarked above, the quantity of these two substances is likely to vary in the solution and in the residue, according to the proportions of water employed. The solution will contain more of the salt and the resin when it is made with a lesser quantity of water, while if the solution is more dilute, the salt and the resin will remain in a larger proportion in the residue.<sup>62</sup>

He describes this salt that he obtained from either of these experiments similarly as in the report of Boullay (1817) and notices an important property (*italics added*):

---

*teinture d'une couleur rouge très foncé que je filtrai encore chaude, et qui ne tarda pas à fournir des cristaux colorés par beaucoup de résine.*

<sup>60</sup> Williams (1857), p. 255 (GB).

<sup>61</sup> Derosne (1803), p. 273 (UM). Originally, *Une partie du sel et de la résine est entraînée avec la matière extractive, l'autre reste non dissoute dans le marc.*

<sup>62</sup> Derosne (1803), p. 273 (UM). Originally, *Mais, comme je l'ai remarqué plus haut, la quantité de ces deux substances est sujette à varier dans la dissolution et dans son residu, suivant les proportions d'eau employées. La dissolution contiendra d'autant plus de sel et de résine, qu'elle aura été faite dans une moindre quantité d'eau, au lieu que si elle est plus étendue, le sel et la résine resteront en plus grande proportion dans le residu.*



The purified salt of opium is white and it crystallizes in straight prisms with rhomboidal bases, often combined together in small tufts. It is tasteless and odorless. It is insoluble in cold water and needs four hundred parts of boiling water to dissolve it where it precipitates on cooling. *The solution does not redden the tincture of Tournesol.* It is soluble in twenty-four parts of boiling alcohol; in cold alcohol it needs nearly one hundred parts. ... One of the most noticeable characters of this salt is its prompt and easy dissolution in all the liquid acids .... But when one saturates these acid solutions with an alkali, the essential salt soon precipitates in the form of a white powder. The caustic alkalis augment a little its solubility in water, and the acids, when not added in excess, precipitate it.<sup>63</sup>

Because it did not redden the tincture of Tournesol, his salts obtained with cold water and alcohol cannot be said to be predominantly acid and are probably neutral.

### 3. THIRD EXPERIMENT

Derosne also reports a third experiment. To the extractive solution he had obtained during experiment one he added potassium carbonate (*italics added*):

---

<sup>63</sup> Derosne (1803), pp. 274-275 (UM). Originally, *Le sel d'opium purifié est blanc, il cristallise en prismes droits à base rhomboïdale, souvent réunis en petites houes. Il est insipide et inodore. Il est insoluble dans l'eau froide; il exige près de 400 parties d'eau bouillante pour sa dissolution dont il se précipite en refroidissant. La dissolution ne rougit pas la teinture de Tournesol. Il est soluble dans vingt-quatre parties d'alcool bouillant; à froid il en demande près de cent. ... Un des caractères les plus tranchans de ce sel, c'est sa prompte et facile dissolution dans tous les acides liquides ... Mais lorsqu'on sature ces dissolutions acides par un alcali, le sel essentiel s'en précipite aussitôt sous forme blanche et pulvérulente. Les alcalis caustiques augmentent un peu sa solubilité dans l'eau, et les acides, lorsqu'un n'en met pas un excès, l'en précipitent.* Boullay (1817), pp. 437-438, has it soluble in 400 parts of boiling alcohol (*quatre cents parties d'alcool amené aussi au degré d'ébullition*) not 400 parts of boiling water. Derosne reports it is soluble in 24 parts of boiling alcohol.

I added to the solution of opium made with six parts of cold water some *potassium carbonate*, until it no longer made a precipitate. The decanted liquor was evaporated a little and made a new quantity [of precipitate]. This precipitate, washed in cold water, is of a tawny color, a little grainy and has little taste. The alcohol that I boiled it in dissolved around three quarters of it and was colored dark red. The filtered solution promptly gave a cloudy crystallization of a reddish color.<sup>64</sup>

He thinks this is the same salt as those he had obtained earlier from the extractive solution using only water but with a difference: "This salt, as we will see, is the same as that obtained by the redissolving of the extract in water, but in a state of particular combination."<sup>65</sup>

He describes the differences between this salt and the previous ones (*italics added*):

The salt precipitated from the solution of the opium by the potassium carbonate presents several differences. Its taste is slightly bitter; it crystallizes much less regularly. Its solubility seems a little greater. *Its solutions turn green the syrup of violets.*<sup>66</sup>

The latter test would normally indicate some kind of base. But Derosne explained the result this way:

---

<sup>64</sup> Derosne (1803), p. 268 (UM). Originally, *Je versai dans une dissolution d'opium faite à froid dans six parties d'eau du carbonate de potasse, jusqu'à ce qu'il n'y occasionnât plus de précipité. La liqueur décantée fut un peu évaporée, et en fournit une nouvelle quantité. Ce précipité, lavé à l'eau froide, est de couleur fauve, un peu grenu et peu sapide. L'alcool que je fis bouillir sur lui en dissolvit environ les trois quarts, et se colora en rouge assez foncé. La dissolution filtrée donna promptement une cristallisation confuse et d'une couleur roussâtre.*

<sup>65</sup> Derosne (1803), p. 268 (UM). Originally, *Ce sel, comme nous le verrons, est le même que celui obtenu par la redissolution de l'extrait dans l'eau, mais dans un état de combinaison particulier.*

<sup>66</sup> Derosne (1803), pp. 276-277 (UM). Originally, *Le sel précipité de la dissolution d'opium par le carbonate de potasse, présente quelques différences. Sa saveur est légèrement amère; il cristallise beaucoup moins régulièrement. Sa solubilité paraît un peu plus grande. Ses dissolutions verdissent le sirop de violettes.*

This different way of acting *indicates that this salt is united to a small quantity of potassium*, but in a state of imperfect combination, and which is more soapy [base] than saline, *because it turns green the syrup of violets*. It appears that when the solution of opium was decomposed by the potassium carbonate, a portion of that alkali reacted in some way with the salt and combined with it ....<sup>67</sup>

He tried to remove what he thought of as the residual potassium combined with his salt but could not (*italics added*):

Whatever should be these conjectures, I tried to remove from this salt the small quantity of potassium that was combined with it, by dissolving it in the most powerful acids, precipitating that solution by an alkali carbonate well saturated, washing the precipitate in boiling water and dissolving it finally in alcohol; but it always remained, and *it still turned the syrup of violets green*.<sup>68</sup>

He even tried to combine a base with the other two salts he obtained using only water and alcohol, but could not do this either (*italics added*):

What is so singular is that the same phenomenon does not take place when the pure salt obtained, whether from the extractive solution or the marc, is dissolved in acids and then precipitated by an alkali. *It is completely as pure as before; its solution in alcohol does not turn green the syrup of violets ....*<sup>69</sup>

---

<sup>67</sup> Derosne (1803), p. 277 (UM). Originally, *Cette différente manière d'être indique que ce sel est uni à une petite quantité de potasse, mais dans un état de combinaison imparfaite, et qui est plutôt savoneuse que saline, puisqu'il verdit le sirop de violettes. Il paraît que lorsqu'on décompose la dissolution d'opium par le carbonate de potasse, une portion de cet alkali réagit d'une manière particulière sur le sel et s'y combine ....*

<sup>68</sup> Derosne (1803), p. 278 (UM). Originally, *Quoiqu'il en soit de ces conjectures, j'ai essayé à enlever à ce sel la petite quantité de potasse qui lui est unie, en le dissolvant dans les acides les plus puissants, précipitant cette dissolution par un carbonate alcalin bien saturé, lavant ce précipité dans l'eau bouillante et le dissolvant ensuite dans l'alcool; mais il l'a toujours retenue, et il verdissait encore le sirop de violettes.*

<sup>69</sup> Derosne (1803), pp. 278-279 (UM). Originally, *Ce qu'il y a de singulier, c'est que le même phénomène n'a pas lieu lorsqu'on dissout dans les acides le sel*

Derosne considers these three different salts to be the same salt; it is just that the last one is simply contaminated with some potassium from the potassium carbonate that he had used to precipitate it. This conjecture as to contamination with an alkali was natural and it will be a point of contention among chemists and pharmacists for the next three decades. As a result, it will cause some chemists to experiment further with extractions of morphine from opium using the so-called neutral salts, including sodium chloride.

He feeds three small doses of his new salt to several dogs making them dizzy, vomit and convulse, effects he compared to a strong dose of opium. Vinegar, he discovers by accident, is the antidote.<sup>70</sup> He thinks of his three salts as being the same but he notices a difference in the last one when he designs future experiments:

The essential would be to assure oneself if the extractive matter entirely despoiled of the resin and the salt still shows its calming effect. The extract the most appropriate for making these experiments is without doubt that which was precipitated by the potassium carbonate.<sup>71</sup>

There was much argument at the time (and there still is) as to just what Derosne had obtained as a result of these various experiments. For example, Henry's 1831 Chemistry observed:

---

*pur obtenu, soit de l'extrait, soit du marc d'opium, et qu'on le précipite ensuite par un alcali, il est tout aussi pur qu'auparavant; sa dissolution dans l'alcool ne verdit pas le sirop de violettes ....*

<sup>70</sup> Derosne (1803), p. 281 (UM).

<sup>71</sup> Derosne (1803), p. 284 (UM). Originally, *L'essentiel serait de s'assurer si la matière extractive entièrement dépouillée de résine et de sel, jouit encore de sa vertu calmante. L'extrait le plus approprié pour faire ces expériences, est sans contredit celui qui a été précipité par le carbonate de potasse.*

The salt of Derosne, it appears from the experiments of Robiquet, is not, as Serturmer supposed, a compound of morphia and meconic acid. ... Morphia and the salt of Derosne appear, from the experiments of Robiquet, to be both ingredients of opium, which are different, and independent of each other. On this subject there appears to be a degree of obscurity ....<sup>72</sup>

Pelletier, writing in 1832, wrote that it was by "treating the extract of opium with water that M. Derosne obtained for the first time narcotine."<sup>73</sup> A century later, Small (1931) is reporting that Derosne's results could have been a number of different compounds: "Serturmer believed that Derosne's salt of opium was morphine acid meconate; Pelletier and Robiquet considered it to have been narcotine."<sup>74</sup>

It is considered as having been narcotine (noscapine) "either as a single substance or in admixture with morphine meconate" in the 21st century.<sup>75</sup> Huxtable and Schwarz (2002) think it was "probably largely narcotine (also known as noscapine) perhaps with meconic acid" and even say that "Derosne's alkaloidal fraction lacked narcotic properties."<sup>76</sup> But Sonnedecker disagrees, writing that "Derosne stated that small amounts exerted the same physiological effect as much greater quantities of the raw material, opium."<sup>77</sup> Jackson and Lipmann (2002) say his crystalline precipitate was "a

---

<sup>72</sup> Henry, William. *The Elements of Experimental Chemistry*. 11th edition. Volume II. Philadelphia, PA: Robert DeSilver, 1831, p. 260 (GB).

<sup>73</sup> Pelletier, J. "Nouvelles Recherches sur l'Opium," *Annales de Chimie et de Physique*, vol. 50. Paris: Chez Crochard, 1832, p. 248. Originally, *C'est en traitant ainsi de l'extrait d'opium par de l'eau que M. Derosne a obtenu pour la première fois la narcotine*.

<sup>74</sup> Small, Lyndon F. *Chemistry of the Opium Alkaloids*. Supplement No. 103 to the Public Health Reports, U. S. Treasury Department, Public Health Service. Washington, D. C.: USGS Printing Office, 1932, p. 138.

<sup>75</sup> Schiff, Paul L. "Opium and its Alkaloids," *American Journal of Pharmaceutical Education*, Summer 2002, p. 15, found at [http://findarticles.com/p/articles/mi\\_qa3833/is\\_200207/ai\\_n9107282/pg\\_15](http://findarticles.com/p/articles/mi_qa3833/is_200207/ai_n9107282/pg_15).

<sup>76</sup> Huxtable and Schwarz, *Molecular Interventions* 1:189-191 (2001), <http://molinterv.aspetjournals.org>.

<sup>77</sup> Sonnedecker, Glenn. *Kremer and Urdang's History of Pharmacy*. Philadelphia, PA: J. P. Lippincott, 1976, p. 361 (GB).

mixture of morphine and narcotine."<sup>78</sup> If Pelletier and Robiquet are correct, then narcotine, not morphine, would have been the "first true drug."

Fifty years after Derosne, the science of obtaining morphine had long since moved on from simple analysis to commercial production, not always so concerned with trying to obtain purity:

It is somewhat amusing to know that morphia is only saleable in powder, and if offered in a state that would to some extent be an evidence of its freedom from adulteration, would be refused.<sup>79</sup>

### C. DISCUSSION

So many chemists and pharmacists in Europe began to pull out the "active principles" of plants during the first decades of the 19th century that this period has since been termed the "Age of the Alkaloids." These pioneering scientists chose medicinal plants and plant extracts to examine first. In this way, a large number of European investigators were experimenting with opium during this era, including Derosne, Séguin and Sertuerner.

Derosne was able to obtain crystalline precipitates using cold water, alcohol and potassium carbonate. He thinks of each one of these results as being the same, except that the latter precipitate had simply been contaminated with the potassium carbonate. His new sedative salt may have been primarily narcotine, but it was probably also mixed with some morphine and meconic acid. He tests his watery solution of opium with lime and forms a precipitate but does not analyze it further.

Derosne is doing one of the first analyses of opium and trying to obtain his crystals in some state of purity; he is not particularly concerned with yield so much as with simply obtaining something. As was seen above, there is still argument over the composition and purity of his final salts. Whatever he obtained, Derosne clearly

---

<sup>78</sup> Jackson, Kenneth C. and Arthur G. Lipmann. "Opioid Analgesics," *Practical Pain Management*, 3rd edition, C. David Tollison, et al., editors. Philadelphia, PA: Lippincott, Williams and Wilkins, 2002, p. 216 (GB).

<sup>79</sup> Williams (1857), p. 251 (GB).

understood the use of cold water and strong bases to extract some kind of a crystalline salt from opium. But Derosne is only one of many European chemists and pharmacists attempting to take apart opium at the beginning of the nineteenth century. Other investigators had also begun to report the results of their work.

## XIV SÉGUIN

---

### XIV. SÉGUIN

- A. LIME AND ARMAND SÉGUIN
  - 1. FIRST EXPERIMENT
  - 2. SECOND EXPERIMENT
- B. DISCUSSION

*A*MONG the many European papers devoted to the analysis of opium during this period, one in particular stands out for its organization and understanding.

### A. LIME AND ARMAND SÉGUIN

Armand Séguin (1767-1835) made a fortune supplying Napoleon's armies with boot leather from his tannery at Sèvres, after finding a way to shorten the tannery process from over a year to just a few weeks.<sup>1</sup> He was a pupil of Lavoisier and collaborated with him on a study of respiration (1789) and "with Fourcroy and Vauquelin on the composition of water (1790)."<sup>2</sup>

Séguin was named by Pelletier as having given "a report before the Academy of Sciences in 1804 [which] described the isolation and properties of morphine and even suggested its basic nature."<sup>3</sup>

---

<sup>1</sup> Doskey, John S., editor. The European Journals of William Maclure. Philadelphia, PA: American Philosophical Society, 1988, p. 211 (GB).

<sup>2</sup> Doskey, quoting Partington's History of Chemistry, vol. 3, pp. 106-107; Capefigue, Jean-Baptiste. Histoire des grandes opérations financières. Vol. II. Paris: Libraire D'Amyot, 1856, p. 86 (GB); [http://fr.wikipedia.org/wiki/Armand\\_Seguin](http://fr.wikipedia.org/wiki/Armand_Seguin).

<sup>3</sup> Small, p. 138, who cites (p. 162) Séguin's paper as appearing in *Ann. chim.* 92, 225 (1814).



Writing in 1832, Pelletier argued strongly the brief for Séguin's preeminence in the discovery of morphine:

M. Séguin signaled the existence of the most energetic principle of opium, described the means of obtaining it, and indicated its essential and distinctive characteristics, so that he only lacked the naming of it morphine in order to be in possession of the honor of its discovery.<sup>4</sup>

In his paper, Séguin "reported finding 'a very peculiar vegetable-animal material.'"<sup>5</sup> But his results "did not attract much attention at first, and it was not published until 1814, in *Annales de Chimie*. By this time reports by other researchers about similar discoveries had already appeared."<sup>6</sup> He did not report any animal or human experiments, according to Huxtable and Schwarz.<sup>7</sup>

John and Charles Watt report that it was not Séguin but Bernard Courtois (1778-1838) who did the basic work on the morphine extraction from opium. Courtois

was one of the young chemists whom Armand Séguin placed in a laboratory which he had just opened to work for the advancement of science to which he owed his immense fortune. In the division of the works which Séguin wished to undertake, Courtois was intended to study opium. He devoted himself to these researches and succeeded in isolating from opium a crystalline body, with alkaline reactions, and susceptible of combination with the bases. However, as he obtained this substance by the intervention of ammonia, he could not affirm that it did not thence derive its alkaline properties. ... The work of Courtois gave rise to a memoir on opium which Séguin read before the

---

<sup>4</sup> Pelletier, J. "Nouvelles Recherches sur l'Opium," *Annales de Chimie et de Physique*, vol. 50. Paris: Chez Crochard, 1832, p. 243. Originally, *M. Séguin signale l'existence du principe le plus énergique de l'opium, décrit la manière de l'obtenir, et indique ses caractères essentiels et distinctifs, de sorte qu'il n'a manqué à M. Séguin que de nommer la morphine pour être en possession de l'honneur de sa découverte*.

<sup>5</sup> Sonnedecker, Glenn. *Kremer and Urdang's History of Pharmacy*. Philadelphia, PA: J. P. Lippincott, 1976, p. 361 (GB).

<sup>6</sup> Drews, Jurgen. *In Quest of Tomorrow's Medicines*. New York: Springer-Verlag, 2003, p. 33 (GB).

<sup>7</sup> Huxtable and Schwarz, *Molecular Interventions* 1:189-191 (2001), <http://molinterv.aspetjournals.org>.

Institute on the 24th of December 1804, and which was only inserted ten years after in the *Annales de Chimie* (t. lxxxix. p. 225). The alkaloid of opium was so clearly described in it, that Vauquelin did not hesitate to give Séguin the priority in the discovery of morphine, when Sertuerner published his work (1816). But this was in reality the fruit of skillful researches of Courtois. The latter quitted Séguin's laboratory in 1804 ....<sup>8</sup>

Courtois later is credited with the isolation of iodine.<sup>9</sup>

Whoever was responsible for the original paper published in 1814, he wrote one of the clearest and better organized of the early treatments.<sup>10</sup> He began the paper, as did Derosne, by noticing a large number of previous investigators:

Opium has already been the subject of a great number of research experiments. Neumann, Wedelin, Hoffmann, Tralle, Proust, Baumé, Josse, Paissé, Desrosnes [sic], Nysten, Dubuc, Deyeux, and many others have all been occupied with this subject.<sup>11</sup>

But because of the many contrary results in their works, he decided to try to isolate all of its principles "in order to determine the action of each of them on the animal constitution."<sup>12</sup>

---

<sup>8</sup> Watt, John and Charles, editors. *The Chemist, A Monthly Journal of Chemical Philosophy and of Chemistry Applied to the Arts, Manufactures, Agriculture, and Medica and Record of Pharmacy*. Vol. III, New Series. London: W. and T. Piper, 1851-1852, pp. 37-39 (GB).

<sup>9</sup> Watt (1851), pp. 37-39 (GB).

<sup>10</sup> "Dans cette dissertation, remarquable par les faits qu'elle renferme et par la clarté avec laquelle ils sont exposés, M. Séguin ...." from Pelletier, J.

"Nouvelles Recherches sur l'Opium," *Annales de Chimie et de Physique*, vol. 50. Paris: Chez Crochard, 1832, pp. 242-243.

<sup>11</sup> Séguin, Armand. "Premier Mémoire sur l'Opium," *Annales de Chimie*. Volume 92. Paris: Chez Crochard, 1814, p. 226 (UM). Originally, *L'opium a déjà été le sujet d'un grand nombre de recherches. Neumann, Wedelin, Hoffman, Tralle, Proust, Baumé, Josse, Paissé, Desrones, Nysten, Dubuc, Deyeux, et plusieurs autres, se sont occupés de cet objet.*

<sup>12</sup> Séguin, *Annales de Chimie*, vol. 92, p. 226 (UM). Originally, *afin de pouvoir déterminer l'action de chacun d'eux sur l'économie animale.*

## 1. FIRST EXPERIMENT

He began his experiments, as did Derosne, by separating the soluble and insoluble parts of opium with cold water:

In order to accomplish this goal, I began by washing the opium of commerce reduced to small morceles with a sufficient quantity of cold water; and I came, by this method, to separate all the soluble substances that it contained, which formed nearly three quarters of its weight.<sup>13</sup>

Again, like Derosne, he next tested the solution for acidity and tried a number of alkalis:

The solution strongly reddened tincture of tournesol, a property that shows the presence of a small quantity of acetic acid. Potash, soda ash and ammonia produce abundant precipitates, insoluble in water, but soluble in warm alcohol.<sup>14</sup>

Unlike Derosne, he decided to follow up and investigate the nature of these precipitates that he has formed by the addition of these three different alkalies. He thinks of these precipitates as being the same: "The alcoholic solution of this precipitate [not these precipitates] gave me, upon cooling, some white, prismatic crystals that I purified with repeated dissolutions and crystallizations in new alcohol."<sup>15</sup>

---

<sup>13</sup> Séguin, *Annales de Chimie*, vol. 92, pp. 225-227 (UM). Originally, *Pour arriver à ce but, j'ai commencé par laver, avec une suffisante quantité d'eau froide, de l'opium du commerce réduit en petits morceaux; et je suis parvenu, par ce moyen, à lui enlever toutes les substances dissolubles qu'il contient, et qui forment à-peu-près les trois quarts de son poids.*

<sup>14</sup> Séguin, *Annales de Chimie*, vol. 92, p. 227 (UM). Originally, *Elle rougissait fortement la teinture de tournesol, propriété qu'elle devait à la présence d'une petite quantité d'acide acéteux. La potasse, la soude et l'ammoniaque y formèrent des précipités abondans, insolubles dans l'eau, mais solubles à chaud dans l'alcool.*

<sup>15</sup> Séguin (1814), p. 227 (UM). Originally, *La dissolution alcoolique de ce précipité me donna, par le refroidissement, des cristaux blanchâtres et prismatiques, que je purifiai par des dissolutions et des cristallisations répétées dans de nouvel alcool.*

He describes these crystals in the same way that Derosne described the crystals obtained from his experiment with potassium carbonate: "In this state of purity, these crystals are insoluble in cold water and in hot water, but are soluble in warm alcohol which, when combined together, acquire a bitterness and turn the syrup of violetttes a light green."<sup>16</sup> Further, his crystals dissolved in acids and were precipitated by alkalis in which they did not dissolve. It was clear to him that he had something new: "From which it results that this crystalline substance can only be considered at this point a new, completely distinct vegetable-animal material."<sup>17</sup>

Having tested his solution with the alkalies and obtained a crystalline precipitate, he then decided to test if anything was still left in the solution. He decides to use the solution he had formed with ammonia. Williams explains why (*italics added*):

Metallic oxides, when precipitated by alkalies, frequently carry down with them a considerable portion of the precipitant, which is often very difficult, and sometimes impossible, to remove perfectly by washing; this makes *ammonia extremely valuable as a precipitant* of such substances, from the facility with which it is *removed by ignition*.<sup>18</sup>

Séguin (or Courtois) notices this same property of ammonia compared to other alkalis:

For the initial analysis of opium, ammonia is preferable to the other two alkalis, because with heat one can remove the ammonia which remains dissolved in the liquor ... while it is very difficult to remove the other two alkalies.<sup>19</sup>

<sup>16</sup> Séguin (1814), p. 227 (UM). Originally, *Dans cet état de pureté, ces cristaux sont insolubles dans l'eau froide et dans l'eau chaude, mais solubles à chaud dans l'alcool qui, par cette combinaison, acquiert de l'amertume et verdit légèrement le sirop de violette.*

<sup>17</sup> Séguin, *Annales de Chimie*, vol. 92, pp. 227-228 (UM). Originally, *D'où il résulte que cette substance cristalline ne peut être jusqu'ici considérée que comme une nouvelle matière végéto animale toute particulière.*

<sup>18</sup> Williams (1857), p. 128 (GB).

<sup>19</sup> Séguin (1814), p. 245 (UM). Originally, *Pour la première analyse de l'opium, l'ammoniaque est préférable aux deux autres alcalis, parce qu'on*

The watery solution remaining from which he had precipitated crystals with ammonia he then tested with the alkaline metal earths, baryta, strontia<sup>20</sup> and lime (*italics added*):

The solution of water with opium, separated by the ammonia from the crystalline substance, no longer precipitates with the alkalis, but does precipitate with the waters of baryta, strontia and *lime*.<sup>21</sup>

He suggests a reason for and describes the nature of this second precipitate (*italics added*):

That strontia, baryta and *lime*, which form with the acid of opium some *insoluble salts*, have more affinity with this acid than does the crystalline substance, and it is for this reason that, when one adds to the watery solution of opium the waters of baryta, strontia or *lime*, *one has a precipitate mixed with the crystalline substance*, and an *insoluble salt* formed by the *combination of the acid of opium with the strontia, baryta or the lime*.<sup>22</sup>

---

*peut chasser par la chaleur l'ammoniaque qui reste à nu dans la liqueur lors de la précipitation de l'acide de l'opium par de la baryte, de la strontiane ou de la chaux, tandis qu'il est très-difficile de la débarrasser des deux autres alcalis.*

<sup>20</sup> "A further earth, strontia (strontium oxide), was identified by the London chemists Adair Crawford and William Cruickshank in 1790 on examining a mineral (strontium carbonate) found in a lead mine at Strontian in Argyllshire, Scotland." Like barium, strontium was isolated as an impure metal by Sir H. Davy in 1808. - from "alkaline-earth metal" in Encyclopaedia Britannica. 2007. EB Online, 1 Dec 2007, <http://search.eb.com/eb/article-9110606>.

<sup>21</sup> Séguin, *Annales de Chimie*, vol. 92, p. 228 (UM). Originally, *La dissolution aqueuse d'opium, séparée par de l'ammoniaque de la substance cristalline, ne précipitait plus par les alcalis, mais précipitait par l'eau de baryte, de strontiane et de chaux.*

<sup>22</sup> Séguin, *Annales de Chimie*, vol. 92, pp. 232-233 (UM). Originally, *Que la strontiane, la baryte et la chaux, qui forment avec l'acide de l'opium des sels insolubles, ont plus d'affinité avec cet acide que n'en a la substance cristalline, et que c'est pour cela que, quand on verse dans la dissolution aqueuse d'opium de l'eau de baryte, de strontiane ou de chaux, on a un précipité mélangé de substance cristalline, et de sel insoluble formé par la combinaison de l'acide de l'opium avec la strontiane, la baryte ou la chaux.*

To recap, he has found what he calls a new crystalline substance in opium and a new acid:

The result of these first experiments is that the crystalline substance in opium is soluble with its own acid, and because of this property, in spite of its own insolubility in water, it is found in abundance in the watery solution of opium.<sup>23</sup>

His theory of affinities explains why the alkalies (potash, soda ash, ammonia) precipitate this new crystalline substance (*italics added*):

That the *alkalies*, which *form with the acid of opium a soluble salt*, have more affinity with this acid than does the crystalline substance, and it is for this reason that, when one adds to the watery solution of opium an alkali, *the crystalline substance* abandons the acid of opium and *is precipitated*, while the combination of this acid and the alkali remains dissolved in the floating liquor.<sup>24</sup>

It is useful to notice at this point that he believes his alkalies (potash, soda ash and ammonia) form soluble salts with this acid while the alkaline metal earths (strontia, baryta, and lime) form insoluble salts with the acid. But in both kinds of precipitates he finds his new crystalline substance.

Even better, by using the alkalis and the alkaline-earth metals in succession he can obtain the acid of opium and the crystalline substance separately (*italics added*):

---

<sup>23</sup> Séguin (1814), p. 232 (UM). Originally, *Il résulte de plus de ces premières expériences, que la substance cristalline de l'opium est soluble dans son acide, et que c'est à raison de cette propriété, que, malgré son insolubilité dans l'eau, on la trouve en abondance dans la dissolution aqueuse d'opium.*

<sup>24</sup> Séguin (1814), p. 232 (UM). Originally, *Que les alcalis, qui forment avec l'acide de l'opium un sel soluble, ont plus d'affinité avec cet acide que n'en a la substance cristalline, et que c'est par ces motifs que, quand on verse dans une dissolution aqueuse d'opium un alcali, la substance (sic) cristalline abandonne l'acide de l'opium et se précipite, tandis que la combinaison de cet acide et de l'alcali reste dissoute dans la liqueur surnageante.*

That it is for these diverse reasons that it is not convenient to employ in the first place the waters of strontia, baryta or *lime* in order to analyze the solution of opium. But by profiting from the differences which exist in this regard between their properties and those of the alkalis, one can, by alternating these substances, obtain separately the acid and the crystalline substance of opium.<sup>25</sup>

He doesn't have a well-developed atomic theory to explain these actions but he does have his theory of affinities (*italics added*):

That it is thus that upon adding an alkali to the solution of opium, one separates first, by superior affinity, the crystalline substance which was held in the solution by the acid of opium, and that in adding next the strontia, baryta or *lime* into the floating liquor, which holds in solution the salt formed by the combination of the acid of opium with the alkali, one decomposes this salt, and one forms *a new salt* composed of *the insoluble acid of opium* with the baryta, strontia or *lime*.<sup>26</sup>

The same theory explains why he can then decompose these new salts with sulfuric acid (*italics added*):

That the baryta, strontia and *lime* having more affinity with sulfuric acid than the acid of opium, one can, in decomposing by sulfuric acid the *insoluble salts* composed of *the acid of opium* with the baryta, strontia or *lime*, obtain on the

---

<sup>25</sup> Séguin, *Annales de Chimie*, vol. 92, p. 233 (UM). Originally, *Que c'est par ces divers motifs qu'il ne convient pas d'employer en premier lieu les eaux de strontiane, de baryte ou de chaux, pour l'analyse de la dissolution d'opium: mais qu'en profitant des différences qui existent à cet égard entre leurs propriétés et celles des alcalis, on peut, en alternant ces substances, obtenir séparément l'acide et la substance cristalline de l'opium.*

<sup>26</sup> Séguin, *Annales de Chimie*, vol. 92, pp. 233-234 (UM). Originally, *que c'est ainsi qu'en versant un alcali dans de la dissolution aqueuse d'opium, on en sépare, d'abord, par affinité supérieure, la substance cristalline qui y était tenue en dissolution par l'acide de l'opium, et qu'en versant ensuite de la strontiane, de la baryte ou de la chaux dans la liqueur surnageante, qui tient en dissolution le sel formé par la combinaison de l'acide de l'opium avec l'alcali, on décompose ce sel, et l'on forme un nouveau composé insoluble d'acide de l'opium et de baryte, de strontiane ou de chaux.*

one hand an insoluble sulfate and on the other the acid of opium free and in its state of purity.<sup>27</sup>

He is also aware that when he adds the alkaline metal earths, two things are happening, not just one (*italics added*):

That the acid of opium having the property of forming with the metals some insoluble salts, there exists, during the mixing of the solution of opium with the metallic salts, *a double decomposition*; that the acid of opium binds with the metals to form with them some insoluble salts, which one can decompose with stronger acids; while the acids of the metallic salts bind with the crystalline material, and are held in the solution: this gives the means of separating the acid from the solution of opium before removing the crystalline substance.<sup>28</sup>

Double decomposition was then explicable by the theory of affinities which supposed that all "chemical phenomenon are owing to Affinity or Chemical Attraction. It is the basis on which the science of chemistry is founded."<sup>29</sup> Decomposition is used within this theory to "imply the separation of the component parts or principles of bodies from each other."<sup>30</sup> Sometimes a compound could be decomposed by a single substance in a process called *single elective affinity*, elective because "a substance manifests, as it were, a choice

<sup>27</sup> Séguin, *Annales de Chimie*, vol. 92, p. 234 (UM). Originally, *Que la barte, la strontiane et la chaux ayant plus d'affinité avec l'acide sulfurique que l'acide de l'opium, on peut, en décomposant par l'acide sulfurique les sels insolubles composés de l'acide de l'opium et de baryte, de strontiane ou de chaux, obtenir, d'une part un sulfate insoluble, et de l'autre l'acide de l'opium libre et dans son état de pureté.*

<sup>28</sup> Séguin, *Annales de Chimie*, vol. 92, p. 234 (UM). Originally, *Que l'acide de l'opium ayant la propriété de former avec les métaux des sels insolubles, il existe, pendant le mélange de la dissolution d'opium avec les sels métalliques, une double décomposition; Que l'acide de l'opium s'empare des métaux pour former avec eux des sels insolubles, qu'on peut décomposer par des acides plus forts; tandis que les acides des sels métalliques s'emparent de la matière cristalline, et la tiennent en dissolution: ce qui donne le moyen de séparer l'acide de la dissolution d'opium avant de lui enlever la substance cristalline.*

<sup>29</sup> Turner (1835), p. 124 (GB).

<sup>30</sup> Ure, Andrew (1831), p. 393 (GB).



for one of two others, uniting with it by preference, and the exclusion of the other. Many of the decompositions that occur in chemistry are instances of single elective affinity."<sup>31</sup>

On the other hand, sometimes two different compounds were brought together (*italics added*):

But it frequently happens that two compounds are mixed together, and four different affinities brought into action. ... Thus, in mixing together a solution of carbonate of ammonia and hydrochlorate of lime ... [e]ach of the acids has an attraction for both bases, and hence it is possible either that the two salts should continue as they were, or that an interchange of principles should ensue, giving rise to two new compounds - carbonate of lime and hydrochlorate of ammonia. ... If the affinity of carbonic acid for ammonia, and of *hydrochloric acid for lime*, exceed that of carbonic acid for lime, added to that of hydrochloric acid for ammonia, then will the two salts experience no change whatever; but if the latter affinities preponderate, then, as does actually happen in the present example, both the original salts will be decomposed, and two new ones generated. Two decompositions and two combinations take place, being an instance of what is called *double elective affinity*.<sup>32</sup>

Kane (1842) gives a second example, a figure and a different name for the process:

[B]y the mutual action of two compound bodies, two new ones may be formed. Thus, when nitrate of lime is decomposed by potash, there is simple decomposition, and the lime is set free; but if in place of pure potash, we employ carbonate of potash, the result is, the formation of carbonate of lime: for when the potash leaves the carbonic acid, to go to the nitric acid, and the nitric acid leaves the lime, to go to the potash, the carbonic acid and the lime, finding themselves in presence of one another, unite and precipitate as carbonate of lime. The nature of the decomposition may be more clearly shown from the figure:

Nitric Acid	Potash
Lime	Carbonic Acid

<sup>31</sup> Turner (1835), p. 125 (GB).

<sup>32</sup> Turner (1835), pp. 126-127 (GB); *italics* Turner for double elective affinity.

The bodies existing before mixture being composed of those written above one another, and those formed by decomposition consisting of those which are in the same horizontal line. This action is termed *double decomposition*.<sup>33</sup>

Gregory (1845) sums it up nicely:

When two compound bodies, AB and CD, act on one another, both decomposition and combination occur. When complete, the change is called double decomposition, since both AB and CD are decomposed; but at the same time the two new combinations AD and CB have been formed. Should the change be only partial, the four compounds AB, CD, AD and CB, will be present together. Double decomposition is of very frequent occurrence.<sup>34</sup>

## 2. SECOND EXPERIMENT

After he has taken apart the solution of opium, along the way discovering a new crystalline substance and a new acid, he turns to the marc, or insoluble part, of opium leftover from the separation with water in the first experiment. He washes it well and notices its resemblance to gluten. As Derosne, he soaks it in alcohol and also discovers crystals (*italics added*):

Part of it dissolves in alcohol which, after this dissolving, gave by evaporation and cooling, first some *crystals similar to the vegetable-animal crystalline substance that I have described above*, then a black and bitter residue that did not dissolve in water, could not be dried by heat, and was liquified by it like grease.<sup>35</sup>

He does not find it strange to find crystals in both the soluble and insoluble parts of opium:

<sup>33</sup> Kane (1842), p. 257 (GB); italics Kane.

<sup>34</sup> Gregory (1845), vol. 1, p. 10 (GB).

<sup>35</sup> Séguin (1814), pp. 235-236 (UM). Originally, *Il se dissout en partie dans l'alcool qui, après cette dissolution, donne par l'évaporation et le refroidissement, d'abord des cristaux semblables à la substance cristalline végéto-animale que j'ai décrite ci-dessus, puis un résidu noir et amer qui ne se dissout pas dans l'eau, ne peut se dessécher par la chaleur, et s'y liquéfie comme de la graisse.*

As the principles of opium exhibit the property of being mutually dissolved, it should not appear astonishing that one should find in the solutions and in the marc of opium a large part of the same principles, but in more or less different proportions, which vary according to the temperature and the quantity of water employed in the solution.<sup>36</sup>

Having separated out the different principles from opium, he tried them on animals in a great number of experiments, but he left these results for a second memoir which does not appear to have been published.<sup>37</sup>

## B. DISCUSSION

Séguin experimented with a combination of cold water, alkalis (potash, soda ash and ammonia) and alkaline-metal earths (baryta, strontia and lime) to extract and isolate the substances which would later become known as morphine and meconic acid. Séguin's work is well organized and he clearly understands the alkaline nature of his new salt. The work of both Derosne and Séguin show some basic similarities with the method employed by Lin, particularly in the use of bases and cold water to form precipitates that can be captured by a filter.

---

<sup>36</sup> Séguin (1814), p. 238 (UM). Originally, *Comme les principes de l'opium jouissent de la propriété de se dissoudre mutuellement, il ne doit pas sembler étonnant qu'on retrouve dans les dissolutions et dans le marc d'opium une grande partie des mêmes principes, mais dans des proportions plus ou moins différentes, qui varient suivant la température et la quantité de l'eau employée à la dissolution.*

<sup>37</sup> Séguin, *Annales de Chimie*, vol. 92 (1814), p. 247 (UM).

## XV SERTUERNER

---

- XV. SERTUERNER
- A. EARLIEST WORK ON MORPHINE
  - B. LATER PUBLICATIONS
  - C. NOMENCLATURE
  - D. DISCUSSION

*A*T around the same time as Derosne and Séguin, a German pharmacist also was separating out the different elements in poppy juice. In some of his experiments he used ammonia and lime.

### A. EARLIEST WORK ON MORPHINE

Frederich Wilhelm Adam Ferdinand Sertuerner (1783-1841) was born in Neuhaus, near Paderborn, Prussia.<sup>1</sup> While still an apprentice, he "began his experiments in a back room of the Hof-Apotheke in Paderborn, Germany."<sup>2</sup> He published a little noticed paper in 1805 in *Trommsdorff's Journal der Pharmazie* 13, (1) 234.<sup>3</sup> In 1806 he published a second paper:

describing the results of some 57 experiments in which he reported the isolation of "principium somniferum," the narcotic principle of opium. Furthermore, he reported that the new substance was alkaline in nature, and was the first representative of a new class of organic bases called "vegetable alkalis" that were "salifyable," that is, bases that formed salts with both organic and inorganic acids.<sup>4</sup>

---

<sup>1</sup> Found at [www.answers.com](http://www.answers.com), [www.opioids.com](http://www.opioids.com), <http://en.wikipedia.org>.

<sup>2</sup> Schiff, p. 7.

<sup>3</sup> Small, pp. 138, 162.

<sup>4</sup> Schiff, p. 7; Huxtable, Ryan J. and Stephan K. W. Schwarz. "The Isolation of Morphine - First Principles in Science and Ethics," *Molecular Interventions*

### Both of these earlier works

fixated on acid constituents of opium. Thus his 1806 paper is mainly concerned with the constituent we now know as meconic acid. He also proposed an aqueous alcoholic extraction of opium that had a "sleep-inducing principle."<sup>5</sup>

He tried the latter on dogs, killed one and made the others vomit. The dogs that lived became drowsy but did not sleep. Huxtable and Schwartz suppose that "[b]ecause these doses of his extract did not cause sleep, we can conclude that the material was highly impure."<sup>6</sup>

### B. LATER PUBLICATIONS

In three later papers, published in 1817 and 1818, while working as a pharmacist in Einbeck, north of Gottingen, he "again called attention to his discovery of a vegetable base capable of neutralizing acids and forming salts."<sup>7</sup> He also included a "review and conclusive re-evaluation of his earlier work, in addition to further new experiments."<sup>8</sup> In these later papers he is said to have "unequivocally reported the isolation of pure morphine. He prepared it by extracting opium with hot water and precipitating the morphine with ammonia. He obtained colorless crystals, poorly soluble in water, but soluble in acids and alcohol."<sup>9</sup> He also reported

---

1:189-191 (2001) quoting the first, second and seventh editions of Goodman and Gilman's *The Pharmaceutical Basis of Therapeutics*. New York: The MacMillan Company, 1941, 1958, 1985; found at <http://molinterv.aspetjournals.org/cgi/content/full/1/1/4/89>.

<sup>5</sup> Huxtable and Schwarz, *Molecular Interventions* 1:189-191 (2001), <http://molinterv.aspetjournals.org>.

<sup>6</sup> Huxtable and Schwarz, *Molecular Interventions* 1:189-191 (2001), <http://molinterv.aspetjournals.org>.

<sup>7</sup> Small, p. 138.

<sup>8</sup> Schiff, p. 7.

<sup>9</sup> Huxtable, Ryan J. and Schwarz, Stephen K. "The Isolation of Morphine - First Principles in Science and Ethics," *Molecular Interventions* 1:189-191 (2001), found at <http://molinterv.aspetjournals.org/cgi/content/full/1/1/4/189>, p. 3.

experiments with the new substance on himself and three friends, which made all of them as sick as he had a decade earlier made the dogs.<sup>10</sup>

William Henry's The Elements of Chemistry (1831) offered a slightly different precis of Sertuerner's recipe taken from the appendix of his first widely-recognized paper:

In 1817, Sertuerner, of Einbeck in Hanover, recommended the following method of obtaining morphia (*Ann. de Ch. et de Phys.* v. 39). Rub together in a mortar eight ounces of powdered opium, two or three ounce-measures of acetic acid, add a little cold distilled water; then add two or three pints of water, and strain the liquor. Add to it a solution of ammonia, and evaporate the liquor to one-fourth. The morphia is precipitated, and may be separated by filtration. The liquid part is a compound of ammonia with the acid ingredient of opium.<sup>11</sup>

Sertuerner's first paper of 1817 also offered a simpler recipe using only opium, hot water and ammonia:

Eight ounces of dried opium were digested several times with hot distilled water until it was no longer colored. After evaporation the different tinctures gave a translucent extract which became cloudy when diluted with water; but with the help of heat or by adding a very large quantity of water, the transparency of the liquor is reestablished. The extract diluted with water is saturated while still warm with ammonia and a greyish white substance precipitates which forms grainy, translucent crystals. Being washed several times until they no longer colored the water, these crystals are, as the result of this investigation will show, the effective part of opium, *das Morphem*, combined with a little of the extract and meconic acid.<sup>12</sup>

<sup>10</sup> Schiff, p. 7.

<sup>11</sup> Henry (1831), p. 257 (GB). Pints are liters, *livres* in Rose (p. 39), *Pfund* in the original (p. 85).

<sup>12</sup> Sertuerner. "Ueber das Morphem," *Annalen der Physik*, ed. L. W. Gilbert. Volume 55. Leipzig: Joh. Abrosius Barth, 1817, pp. 61-62. Originally, *Acht Unzen trockenes Opium wurden zu wiederholten Malen mit geringen Mengen destillirten Wassers heiss digerirt, bis dieses davon nicht mehr gefärbt wurde. Die verschiedenen Flüssigkeiten gaben nach dem Abrauchen ein durchsichtiges Extract, welches beim Verdünnen mit Wasser sich stark trübte, und nur durch Hülse der Wärme oder einer grössern Menge Wassers*

He purified his crystals with sulfuric acid and water, reprecipitated them with ammonia, and decolorized them with alcohol.

In his 1817 papers Sertuerner also tried (as he did in 1806) isolating and analyzing meconic acid but in the process of sublimation his apparatus cracked; he was able to obtain very little of this acid and so was not able to examine the salts it would make with various bases. Though his equipment broke, Sertuerner did have enough of his meconic acid to try combining it with lime (*italics added*):

Only as it were in passing I glance at an acid salt which it describes with *lime*: it crystallizes in prisms, is hardly soluble and seems not to fully decompose with sulfuric acid, showing thus the great affinity the meconic acid has for the *lime*, and generally that this acid possesses great strength.<sup>13</sup>

---

*die Durchsichtigkeit wieder erhielt. Das mit Wasser verdünnte Extract wurde noch warm mit Ammoniak übersättigt, worauf ein weissgrauer Körper niedersiel, der jedoch bald und grösstentheils die Krystallengestalt annahm, und durchscheinende Körner darstellte. Diese mit Wasser wiederholt gewaschen, bis sie dasselbe nicht mehr färbten, sind, wie die Folge dieser Untersuchung zeigt, der eigentlich wirksame Bestandtheil des Opiums, das Morphinum, nur noch mit etwas Extractivstoff und Mekonsäure verbunden.*

The same article, without Gilbert's notes and with corrections, was translated into French by M. Rose, a pharmacist in Berlin, appearing as *Analyse de l'Opium* in *Annales de Chimie et de Physique*, vol. 5. Paris: Chez Crochard, 1817, pp. 21-42. In Rose's translation this excerpt from page 23 became, *Huit onces d'opium desséché ont été digérées à chaud à plusieurs reprises avec de l'eau distillée, jusqu'à ce qu'elle ne fût plus colorée. Après avoir évaporé les teintures, on obtint un extrait translucide, qui se troublait fortement en le delayant dans l'eau: mais à l'aide de la chaleur ou en ajoutant une plus grande quantité d'eau, on rétablissait la transparence de la liqueur. On satura la dissolution aqueuse de l'extrait par un excès d'ammoniaque, et il se précipita une substance d'un blanc grisâtre, qui se formait en cristaux grenus et translucides. Ces cristaux étant lavés par l'eau à plusieurs reprises sont la morphine, la partie efficace de l'opium, combinée avec un peu d'extractif et d'acide mèconique, comme on le verra par la suite de ce Mèmoire.*

<sup>13</sup> Sertuerner. "Ueber das Morphinum," *Annalen der Physik*, ed. L. W. Gilbert. Volume 55. Leipzig: Joh. Abrosius Barth, 1817, p. 74. Originally, *Nur gleichsam im Vorbeigehen sah ich ein saures Salz, welches sie mit Kalk darstellt: es krystallisirt in Prismen, ist schwer auflöslich, und scheint von der*

Ure (1831) describes sublimation as a "process by which volatile substances are raised by heat, and again condensed in the solid form. The operation is founded upon the same principles as distillation, and its rules are the same, as it is nothing but a dry distillation."<sup>14</sup> It was often used to effect crystallization: "Bodies may also be crystallized by sublimation. When a substance has been converted into vapour, and that, in condensing, it assumes at once, the solid form, its particles arrange themselves so as to form crystals."<sup>15</sup> The apparatus used in the process of sublimation was simple but could be somewhat delicate as it (*italics added*)

merely consists of two platinum crucibles, one rather larger than the other, the larger being inserted so as to penetrate a short distance inside the smaller. The upper one is filled with cold water during the process, which, if required, may be removed with a pipette as it becomes heated, and be replaced with fresh. *Two porcelain crucibles* may sometimes be substituted with advantage for the platinum, but in this case it is generally unsafe to fill the upper one with water, as such a proceeding would, in all probability, *be the cause of fracture*.<sup>16</sup>

In the same volume of its French translation in *Annales de Chimie et de Physique*, Robiquet confirmed, corrected and expanded upon the results of Sertuerner. After successfully separating out more of the meconic acid, Robiquet tested it with baryta and magnesia. He repeated Sertuerner's experiments with lime (*italics*

---

*Schwefelsäure nicht völlig zersetzt zu werden, zeigt also eine sehr grosse Neigung der Mekonsäure zum Kalke an, so wie überhaupt diese Säure eine grosse Mächtigkeit besitzt.* Rose has: "I only combined it with lime: it then formed an acid salt. The meconate of lime crystallizes in prisms; it is little soluble and is not decomposed by sulfuric acid." Originally, *Je ne l'ai combiné qu'avec la chaux: alors il forme un sel acide. La méconate de chaux cristallise en prismes; il est peu soluble et n'est pas décomposé par l'acide sulfurique.* *Annales de Chimie et de Physique*, eds. Gay-Lussac and Arago. Volume 5. Paris: Chez Crochard, 1817, pp. 31-32. Rose translates Sertuerner's *Morphium to morphine* throughout.

<sup>14</sup> Ure (1831), p. 769 (GB).

<sup>15</sup> Kane (1842), p. 76 (GB).

<sup>16</sup> Williams (1857), p. 245 (GB).



added): "Finally, this acid forms some salts more or less soluble with potash, soda ash and *lime*."<sup>17</sup> Robiquet notices soluble salts with lime while Séguin noticed the insoluble salts. Another chemist, Vogel, also repeated Sertuerner's experiments the same year (*italics added*):

In place of ammonia, I used ammonia carbonate in crystal. I also used *lime* and baryta. But a part of these earths is precipitated with the morphine along with a large quantity of coloring matter, making it harder to purify the morphine with alcohol.<sup>18</sup>

Sertuerner's second paper on the subject in 1817 in the *Annalen der Physik* was preceded by translations from the French (by Gilbert) of Robiquet's analysis of his work and Orfila's experiments with the new substance on animals. His third paper in 1818 was a response to Robiquet's critique and he reported further experiments with a number of different substances including alcohol, baryta, magnesia, ammonia as well as with meconic acid and lime.<sup>19</sup>

Sertuerner's work of 1817 and 1818 received a different response from that which he had done earlier:

---

<sup>17</sup> Robiquet. "Observations sur le Mémoire de M. Sertuerner, relatif à l'analyse de l'Opium," *Annales de Chimie et de Physique*, eds. Gay-Lussac and Arago. Volume 5. Paris: Chez Crochard, 1817, p. 284. Originally, *Enfin, cet acide forme des sels plus ou moins solubles avec la potasse, la soude et la chaux*.

<sup>18</sup> Vogel. "Expériences sur la Morphine et l'Acide Méconique," *Journal de Pharmacie*. Vol. 3. Paris: Chez L. Colas, 1817, p. 448 (GB). Originally, *Au lieu d'ammoniaque, je me suis servi de carbonate d'ammoniaque en cristaux: j'ai également employé la chaux et la baryte; mais une partie de ces terres se précipite avec la morphine et entraîne une trop grande quantité de matière colorante: de sorte que l'on a plus de peine à purifier la morphine par l'alcool*.

<sup>19</sup> Sertuerner, F. W. "Bemerkungen über der Herrn Robiquet's Abhandlung über das Opium," *Annalen der Physik*. Ed. L. W. Gilbert. Volume 59. Leipzig: Joh. Ambrosius Barth, 1818, footnote, p. 54 (UM).

His second publication[s] on the theme were enthusiastically received by eminent scientists like Gay-Lussac, considering it the most important medical discovery made by mankind to that moment, with more certain effects than opium and as a very superior analgesic. In 1818, morphine entered into the *Materia Medica*.<sup>20</sup>

Gay-Lussac added a postscript to the French translation of Sertuerner's first paper:

*We are surprised that the first work of M. Sertuerner has not attracted more attention from the chemists, not so much in France, where it does not appear that it was known, but on the rest of the continent. The discovery of an alkaline base formed of carbon, hydrogen, oxygen and nitrogen, in which the neutralizing properties are very pronounced, seems to us of very great importance, and it is for this reason that we are bound to give this knowledge to our readers. ... We are not afraid to advance the idea that the discovery of morphine is going to open a new field ....*<sup>21</sup>

It did. Sertuerner's work almost immediately engendered a series of researches into the other alkaloids of opium as well as the alkaloids of many other plants:

---

<sup>20</sup> Escotado, Antonio. *Historia general de las drogas*. Madrid: Espasa-Calpa, 1998, p. 425. Originally, *Su segunda publicación sobre el tema fue saludada entusiásticamente por eminencias como Gay-Lussac, considérandose desde entonces el más notable medicamento descubierto por el hombre, de efectos más seguros que el opio y con una virtud analgésica muy superior. En 1818, la morfina ingresa en la Materia Medica*.

<sup>21</sup> Gay-Lussac, "Observation du Rédacteur," appended to "Analyse de l'Opium," by M. Sertuerner, translated by M. Rose, *Annales de Chimie et de Physique*, vol. 5. Paris: Chez Crochard, 1817, pp. 41-42. Originally, *Nous sommes surpris que le premier Mémoire de M. Sertuerner n'ait pas fixé plutôt l'attention des chimistes, non en France, où il ne paraît pas qu'il ait été connu, mais sur le reste du continent. La découverte d'une base alcaline formée par le carbone, l'hydrogène, l'oxygène et l'azote, dans laquelle les propriétés neutralisantes sont très-prononcées, nous paraît de la plus grande importance, et c'est pour cette raison que nous nous sommes empressés d'en donner connaissance à nos lecteurs. ... Nous ne craignons pas d'avancer que la découverte de la morphine va ouvrir un champ nouveau ....*

The remarkable discovery of Serturmer, that the opium of commerce contains a vegetable alkali or salt basis (morphia), to which its soporific virtues are owing, led the way to a train of vegetable research, from which large accessions of knowledge have been obtained ....<sup>22</sup>

This was Henry's opinion in 1831, only a decade and a half later. With the accumulated hindsight of a century, the extraction and isolation of morphine by Serturmer was appreciated as something both more and less than this:

Serturmer initiated the development of natural product chemistry, and he stimulated the evolution of synthetic and degradative chemistry for the structural elucidation of complex crystalline chemicals isolated from plants. Initially the emphasis was on alkaloid extraction, because of the ease of acid extraction of alkaline salts and the ease of purification by organic extraction of lipophilic free alkaloids from basified medium. Hanzlik comments, "The isolation of morphine was a comparatively humble achievement. It required no munificent grant, no extensive laboratory equipment, no highly organized institute or factory."<sup>23</sup>

### C. NOMENCLATURE

As with the alkaloids in general, there was an early debate over what to call this particular substance. Schiff (2002) says that Serturmer coined the term "morphine" from "Morpheus (Greek god of dreams)."<sup>24</sup> Huxtable and Schwarz (2001) report the derivation with a slight difference:

In view of its dream-inducing properties, Serturmer named his crystalline material "morphium," derived from "Morpheus," the Latin name that Ovid (43BC-17AD) used for the god of dreams (*Metamorphoses*, Book XI).

---

<sup>22</sup> *Report of the First and Second Meetings of the British Association of the Advancement of Science*. London: John Murray, 1835, p. 496 (GB).

<sup>23</sup> Huxtable and Schwarz, *Molecular Interventions* 1:189-191 (2001), <http://molinterv.aspetjournals.org>, quoting P. J. Hanzlik's "The 125th Anniversary of the Discovery of Morphine by Serturmer," *J. Am. Pharm. A.* 18:375-384, 1929.

<sup>24</sup> Schiff, p. 7.

Morpheus was the son of Somnus, the god of sleep. Ovid derived the word from the Greek, *morphe*, or form, because the god of dreams gives airy nothings their form and fashion. In Hesiod, dreams were the daughters, and not the sons, of Night.<sup>25</sup>

Was the derivation from Greek or Latin mythology? Britannica.com calls Morpheus

in Greco-Roman mythology, one of the sons of Hypnos (Somnus), the god of sleep. Morpheus sends human shapes (Greek, *morphe*) of all kinds to the dreamer, while his brothers Phobetor (or Icelus) and Phantasus send the forms of animals and inanimate things, respectively.<sup>26</sup>

The Encyclopaedia Britannica (1998) lists Morpheus as

in Greek mythology, one of the sons of Somnus, the god of sleep. He sends human shapes (Greek *morphe*) of all kinds to the dreamer, while his brothers Phobetor (or Ikelos) and Phantasus send the forms of animals and inanimate things. It is possible, although not very probable, that his name actually meant Dark (from Greek, *morphnos*).<sup>27</sup>

The 1965 Britannica cites Morpheus as

in Ovid (*Metamorphoses* xi, 635), one of the sons of Somnus, the god of sleep. He calls up human shapes (Gr. *morphe*) of all kinds to the dreamer, while his brothers Phobetor and Phantasus assume the forms of all kinds of animals and inanimate things. It is barely possible that Ovid misinterprets his name and that it really means "dark" (Gr. *morphnos*). Whether he is a popular or literary figure is uncertain.<sup>28</sup>

The 1911 Encyclopaedia Britannica has Morpheus as

---

<sup>25</sup> Huxtable and Schwarz, *Molecular Interventions* 1:189-191 (2001), <http://molinterv.aspetjournals.org>.

<sup>26</sup> From [www.britannica.com/eb/article-9053798/Morpheus](http://www.britannica.com/eb/article-9053798/Morpheus).

<sup>27</sup> "Morpheus," The New Encyclopedia Britannica. 15th edition. Chicago: E. B. Inc., 1998, p. 31.

<sup>28</sup> "Morpheus," Encyclopaedia Britannica. Vol. 15. Maximinus to Naples, Kingdom of. Chicago, IL: William Benton, 1965, p. 856.

in Roman mythology, one of the sons of Somnus, the god of sleep. He was a personification invented by Ovid (*Metam.* xi. 635), of the power that calls up human shapes (*morphai*) of all kinds to the dreamer. His brothers Phobeton and Phantasus assumed the forms of all kinds of animal and inanimate objects.<sup>29</sup>

In book 11 of the *Metamorphoses*, Ovid describes a scene from the House of Sleep:

The God, uneasy `till he slept again,  
 Resolv'd at once to rid himself of pain;  
 And, tho' against his custom, call'd aloud,  
 Exciting Morpheus from the sleepy crowd:  
 Morpheus, of all his numerous train, express'd  
 The shape of man, and imitated best;  
 The walk, the words, the gesture could supply,  
 The habit mimick, and the mein bely;  
 Plays well, but all his action is confin'd,  
 Extending not beyond our human kind.  
 Another, birds, and beasts, and dragons apes,  
 And dreadful images, and monster shapes;  
 This demon, Iselos, in Heav'n's high hall  
 The Gods have nam'd; but men Phobeton call.  
 A third is Phantasus, whose actions roul  
 On meaner thoughts, and things devoid of soul;  
 Earth, fruits, and flow'rs he represents in dreams,  
 And solid rocks unmov'd, and running streams.  
 These three to kings, and chiefs their scenes display,  
 The rest before th'ignoble commons play.  
 Of these the chosen Morpheus is dispatch'd;  
 Which done, the lazy monarch, over-watch'd,  
 Down from his propping elbow drops his head,  
 Dissolv'd in sleep, and shrinks within his bed.<sup>30</sup>

<sup>29</sup> From [www.1911Encyclopedia.org/Morpheus](http://www.1911Encyclopedia.org/Morpheus).

<sup>30</sup> From <http://classics.mit.edu/Ovid/metam.11.eleventh.html>. Translated by Sir Samuel Garth, John Dryden, et al.

The Greek god of sleep does seem to have been Hypnos (Hypnos) and one website lists the Oneiroi (Dreams) as his siblings (*italics added*):

Hypnos, the personification and god of sleep, the Latin Somnus, is described by the ancients as a brother of Death (thanatos), and as son of Night (Hes. Theog. 211, &c; Virg. Aen. vi. 277). Hesiod, *Theogony*, 21, ff. (trans. Evelyn-White) (Greek epic C8th or C7th B.C.): "And Nyx (Night) bare hateful Moros (Doom) and black Ker (Violent Death) and Thanatos (Death), and she bare Hypnos (Sleep) and the tribe of Oneiroi (Dreams)." ... Homer, *Iliad* 14. 231 ff (trans. Lattimore) (Greek epic C8th B.C.): "There (in Lemnos) she (Hera) encountered Hypnos (Sleep), the brother of Thanatos (Death). "Put to sleep the shining eyes of Zeus under his brows as soon as I have lain with him in love." Hypnos was depicted as a young man with wings on his shoulders or brow. *His attributes included either a horn of sleep-inducing opium, a poppy-stem, a branch dripping water from the river Lethe (Forgetfulness), or an inverted torch.* His Roman equivalent was Somnus or Sopor.<sup>31</sup>

The entry at Wikipedia for *Theogony* has "Nyx ... produced children parthenogenetically: ... Oneiroi (Dreams), ... Hypnos (Sleep) ...."<sup>32</sup> Two different websites translate the same line from the poem: "And Night bare hateful Doom and black Fate and Death, and she bare Sleep and the tribe of Dreams."<sup>33</sup> Another uses: "And Night bore hateful Doom and black Fate and Death, and she bore Sleep and the tribe of Dreams."<sup>34</sup> The Greek is transliterated as: "*nux d'eteken stugeron te Moron kai Kêra melainan kai Thanaton, teke d'Hupnon, etikte de phulon Oneirôn ....*"<sup>35</sup> Samuel Butler translates Homer's Oneiroi as dreams:

<sup>31</sup> From [www.theoi.com/Daimon/Hypnos.html](http://www.theoi.com/Daimon/Hypnos.html).

<sup>32</sup> From <http://en.wikipedia.org/wiki/Theogony>.

<sup>33</sup> From [www.sacred-texts.com/da/hesiod/theogony.htm](http://www.sacred-texts.com/da/hesiod/theogony.htm) and [http://ancienthistory.about.com/library/bl/bl\\_text\\_hesiod\\_theogony\\_3.htm](http://ancienthistory.about.com/library/bl/bl_text_hesiod_theogony_3.htm).

<sup>34</sup> From [www.perseus.tufts.edu/cgi-bin/ptext?doc=Perseus%3Atext%3A1999.01.0129](http://www.perseus.tufts.edu/cgi-bin/ptext?doc=Perseus%3Atext%3A1999.01.0129).

<sup>35</sup> From [www.perseus.tufts.edu/cgi-bin/ptext?doc=Perseus:text:1999.01.0130:card=1](http://www.perseus.tufts.edu/cgi-bin/ptext?doc=Perseus:text:1999.01.0130:card=1).

When they had passed the waters of Oceanus and the rock Leucas, they came to the gates of the sun and the land of dreams (*oneirôn*), whereon they reached the meadow of asphodel where dwell the souls and shadows of them that can labour no more.<sup>36</sup>

The name Morpheus may appear to be Greek but the mythology is Roman, specifically from Ovid.

Lopez-Muñoz and Alamo (2007) report that it was not even Sertuerner who coined the term "morphine" but the "dean of French chemists" Joseph Louis Gay-Lussac, who

proposed using the suffix "-ine" in order to denominate these organic bases. Thus, Gay-Lussac changed the term "morphium" to "morphine." This was the first attempt to establish a nomenclature in the realm of Organic Chemistry.<sup>37</sup>

Sertuerner continued to refer to his discovery as *morphium* in his second paper in 1817 but noted Gay-Lussac's change: "And likewise herein lies the reason why Herr Gay-Lussac proposes to interchange the name morphine for *morphium*, for decorum's sake. As was said earlier, I hereby follow the analogy."<sup>38</sup> It seems then that *morphine* is actually Gay-Lussac's French version of Sertuerner's *morphium* derived from Ovid's name for a god of dreams in human form, Morpheus, one of three sons of a Roman god of sleep, Somnus, renamed from the Greek god of sleep, Hypnus,

---

<sup>36</sup> From the *Odyssey*, chapter 24, found at <http://classics.mit.edu/Homer/odyssey.24.xxiv.html>.

<sup>37</sup> Lopez-Muñoz, Francisco and Cecilio Alamo. "La síntesis de la morfina: del milagro de la analgesia a la maldición de las dependencias (The Isolation of Morphine: from the miracle of analgesia to the curse of addiction)," *Redes de Investigación en Medicamentos*, Madrid Farmaindustria, 9 July 2007, p. 16. Originally, *el decano de los químicos franceses ... propuso utilizar el sufijo "-ina" para denominar a estas bases orgánicas. Así, Gay-Lussac cambió el término "morphium" por "morfina." Este fue el primer intento de establecer una nomenclatura en el ámbito de la Química Orgánica.*

<sup>38</sup> Sertuerner, F. W. "Ueber eins der fürchterlichsten Gifte der Pflanzenwelt," *Annalen der Physik*. Volume 57. Leipzig: Joh. Abrosius Barth, 1817, p. 193 (UM). Originally, *Und hierin liegt auch der Grund, warum ich den Namen Morphium mit dem von Herrn Gay-Lussac vorgeschlagenen Morphine zu vertauschen, Anstand nehme. Ich folgte hierbei, wie gesagt, der Analogie.*

who was often associated with opium or the poppy. After reading the passage from Ovid, it is easier to understand why Sertuerner decided to name his new substance, *morphium*.

But while there was agreement on the term *alkaloid* for the general class of these new vegetable principles and a tiff between the German supporters of *morphium* and the French advocates of *la morphine*, there was also a dispute among the English over how to name each new principle so as to indicate their chemical affinities. Writing in 1831, Henry gave this explanation:

At first they were distinguished by names ending in *ine*, as morphine, strychnine, etc., but for the sake of conformity to the nomenclature of other alkalis, their names have since been modified, and the termination in *a* is now limited to those substances which have alkaline properties; that in *ine* being applied to vegetable principles which are not alkaline.<sup>39</sup>

As a result, what is termed morphine in the 21st century was known in English during the first part of the 19th century as *morphia*. Henry (1831) uses this designation as does Murray, Crawford, et al., in their Historical and Descriptive Account of China (1836). So Sertuerner's *morphium* became in French *la morphine* while in English it was still called *morphia* for a time.

#### D. DISCUSSION

Sertuerner uses hot water to extract the morphine and ammonia to precipitate it and gives two recipes, one with cold water and ammonia and another recipe in the appendix using cold water, acetic acid and ammonia. He does note that lime combines well with meconic acid, confirmed experimentally earlier by Séguin (Courtois) and afterwards by Robiquet. Robiquet repeated Sertuerner's experiments and tried baryta, magnesia, potash, soda ash and lime on meconic acid. Vogel also repeated Sertuerner's experiments and successfully tried substituting ammonium carbonate, baryta and lime to precipitate the morphine.

---

<sup>39</sup> Henry (1831), p. 257 (GB).



In the first two decades of the nineteenth century, European chemists and pharmacists focussed their efforts upon the analysis of opium, using simple techniques to divide the medicinal substance into its separate parts. Derosne obtains a crystalline salt with sedative properties using only water and a slow evaporation, for example. He also experiments with a strong base, potassium carbonate, but the result he confuses with that from his earlier experiments. His work is considered one more example of the many investigations then being undertaken. Séguin (Courtois) does the first methodical investigation of the substance, carefully teasing it apart with water, alcohol and both strong and weaker bases, including lime, baryta and strontia. He clearly obtains both morphine and meconic acid but does not name either. His work is read as early as 1804 and published in 1814 but little notice is taken of his methods or results. Sertuerner's early papers on the subject are also ignored. He revises them and does a number of new experiments and confidently names his new crystalline substance, *das morphium*. Further, his animal tests are included which demonstrate the sedative properties of this new crystalline substance he has derived from opium. These later papers are quickly recognized, his results are widely reported and Sertuerner receives the credit for the discovery.

But not every chemist shares Sertuerner's confidence that he has obtained the pure sedative principle. In the next two decades, his results must be confirmed by other investigators who will apply new methods of analysis to the extraction of alkaloids from several dozen medicinal plants. Further, this second generation of chemists and pharmacists will move away from the earlier emphasis on laboratory analysis. In particular, the use of simple, inexpensive ingredients such as lime will gradually become more important as the techniques for extracting and isolating morphine from opium become more refined and adapted to commercial production.

## XVI CONFIRMATION

---

- XVI. CONFIRMATION
- A. SALT, LIME AND ROBINET
  - B. SALT, LIME AND PELLETIER AND GUIBOURT
  - C. SALT, MAGNESIA, LIME AND ROBIQUET
  - D. DISCUSSION

*M*ANY eminent chemists refused to accept these early results, arguing that this new crystalline salt could not be considered alkaline in nature because it was obviously a product of a chemical reaction involving strong bases. A number of investigators attempted to confirm the results of Sertuerner, Séguin (Courtois) and Derosne by extracting this new salt without the use of strong, caustic alkalies.

### A. LIME, SALT AND ROBINET

The "celebrated chemist"<sup>1</sup> Stéphane Robinet (1796-1869)<sup>2</sup> investigated the properties of a wide variety of substances, including cinnamon,<sup>3</sup> sarsaparilla,<sup>4</sup> mustard,<sup>5</sup> and milk.<sup>6</sup> He also suggested

---

<sup>1</sup> "Parisian Medical Intelligence," *The London Lancet, A Journal of British and Foreign Medical, Surgical, and Chemical Science, Criticism, Literature and News*. eds. Thomas Wakely, et al. Vol. II. New York, NY: \_\_\_\_\_, 1860, p. 452 (GB). "Celebrated chemist" may be ironic.

<sup>2</sup> From [www.patrimoine-de-france.org/hommes/honneurs-382.html](http://www.patrimoine-de-france.org/hommes/honneurs-382.html), [www.darwinisme.org](http://www.darwinisme.org), and [www.sudoc.abes.fr](http://www.sudoc.abes.fr).

<sup>3</sup> Wöhler, "On some principles of white cinnamon," *The Chemist, or Reporter of Chemical Discoveries and Improvement*, editors Charles and John Watt. Vol. V. London: Alexander Watt, 1844, p. 114 (GB).

the commercial production of "secret" medical remedies based upon discarded remnants of medicinal processes<sup>7</sup> and developed a simple and useful method of crystal purification.<sup>8</sup> He translated John's Animal Chemistry and was an early editor and contributor to the *Journal de Chimie Médicale, de Pharmacie et de Toxicologie*.<sup>9</sup> He acted as secretary to the *Société de Chimie Médicale* and sponsored Morson's membership in 1832.<sup>10</sup>

Robinet also made some important contributions to the "analysis of opium, first publishing his researches in 1825"<sup>11</sup> in a work "which contains several new procedures applicable to the analysis of vegetable substances and to some interesting facts for the history of morphine."<sup>12</sup> Among other contributions Robinet is credited with a new test for the presence of morphine which "when

<sup>4</sup> Viroy, J.J. "De l'origine de la salsepareille rouge (fausse salsepareille)," *Journal de Pharmacie*, eds. P.-J. Bouillon-Lagrange, et al. Vol. 11. Paris: Chez Louis Colas fils, 1825, p. 74 (GB).

<sup>5</sup> Duncan, Andrew. Supplement to the Edinburgh New Dispensatory. Edinburgh: Bell and Bradfute, 1829, p. 98 (GB)

<sup>6</sup> "A Select Practical Formulary," *The Medical Times*. Vol. 12. London: J. Angerstein Carfrae, 1845, p. 172 (GB).

<sup>7</sup> "Parisian Medical Intelligence," *The London Lancet*, eds. Thomas Wakely, et al. Vol. II. New York, NY: \_\_\_\_\_, 1860, p. 452 (GB).

<sup>8</sup> Robinet, S. "On a new Method of Purifying Crystals," *The Edinburgh New Philosophical Journal*, Robert Jameson, conductor. Edinburgh: Adam Black, et al., 1826, p. 326 (GB).

<sup>9</sup> Burrows, G. M. and A. T. Thomson, editors. *The London Medical Repository, Monthly Journal and Review*. Vol. VII. London: Printed for the Proprietors, 1817, p. 43 (GB); Chevallier, et al., editors. *Journal de Chimie, Médicale, de Pharmacie et de Toxicologie*. Vol. 3. Paris: Chez Bechet Jeune, 1827, title page (GB).

<sup>10</sup> Morson, Anthony. Operative Chymist. Amsterdam: Editions Rodapi, B. V., 1997, p. 26 (GB).

<sup>11</sup> Morson, p. 29 (GB).

<sup>12</sup> Pelletier, J. "Nouvelles Recherches sur l'Opium," *Annales de Chimie et de Physique*, vol. 50. Gay-Lussac, Arago, editors. Paris: Chez Crochard, 1832, p. 245. Originally, *Je citerai aussi un mémoire de M. Robinet qui contient quelques procédés nouveaux applicables à l'analyse des végétaux et à quelques faits intéressans pour l'histoire de la morphine*.

placed in contact with a salt of the peroxide of iron, develops a very beautiful color blue."<sup>13</sup>

He is most well known for his research on the "peculiar solvent powers of different saturated saline solutions."<sup>14</sup> He applied this technique of using solutions of different salts to the vegetable extract, opium. Essentially, he replaced the alkalies in the opium solutions of Derosne, Séguin (Courtois) and Sertuerner with sea salt.

At the time, it was thought by some that the result of such an experiment might settle a debate that extended back to the experiment of Derosne with opium and potassium carbonate. A number of chemists (including Robiquet) had argued that the perceived alkaline characteristic of morphine was an artifact of the methods used to obtain it. They believed that in the process of using alkalies (potash, soda ash and ammonia) to precipitate morphine from opium, there may have been traces left of the alkali after purification and it was because of this contamination that the new substance showed the result that it tested base. Salt, on the other hand, was thought of as being neutral.

Derosne in his precipitation of morphine with potassium carbonate had been faced with the same conundrum. In the opinion of Robiquet, Derosne (*italics added*):

gave in his memoir different methods of extracting it and he remarked that it could be obtained by the addition of alkalies to solutions of opium in water; but he observed at the same time that it caused then *a modification resulting from its combination with a small portion of the alkali employed in its precipitation.*<sup>15</sup>

---

<sup>13</sup> Pelletier, J. *ACP*, vol. 50, p. 272. Originally, *Une propriété caractéristique de la morphine est celle qu'elle possède de développer une très-belle couleur bleue lorsqu'on la met en contact avec un sel de peroxide de fer. Cette propriété remarquable a été signalé par M. Stephane Robinet.*

<sup>14</sup> Hodge, Hugh L., M. D. *North American Medical and Surgical Journal*. Vol. I. Philadelphia, PA: J. Dobson, 1826, p. 238 (GB).

<sup>15</sup> Robiquet. "*Observations sur le Mémoire de M. Sertuerner, relatif à l'analyse de l'Opium,*" *Annales de Chimie et de Physique*, vol. 5. Paris: Chez Crochard, 1817, p. 276. Originally, *donne, dans son Mémoire, les différens moyens de l'extraire, et il fait remarquer qu'on peut en obtenir, par l'addition des alcalis, dans les dissolutions aqueuses d'opium; mais il observe en même*

Derosne knew he had discovered "a new immediate principle of the vegetables."<sup>16</sup> But he theorized that the salt he had precipitated with potassium carbonate was "united to a small quantity of potassium, but in a state of imperfect combination, which is more soapy [base] than saline, because it turns green the syrup of violets."<sup>17</sup>

Séguin (or Courtois) also knew he had arrived at a "new, completely distinct vegetable-animal material."<sup>18</sup> He precipitated his salt with potash, soda ash and ammonia and investigated the properties of these precipitates, noticing in each case that "these crystals ... acquired the bitterness and turned the syrup of violets a light green."<sup>19</sup> The other two alkalies were difficult to purify from the final result but the ammonia could be driven off with heat; since all three salts showed the same effect, he could reasonably conclude he had the same new salt with alkaline properties.<sup>20</sup> To paraphrase Gay-Lussac, it was surprising that the memoir of Séguin had not come to the attention of the chemists, not so much to those on the continent where his work was not known, but to those in France.

Sertuerner repeated the same experiment as Séguin with ammonia, and like Séguin, had more faith than Derosne in his ability to purify his new substance. Sertuerner noted that it tested base and could have concluded it was contaminated but instead (in the words of Robiquet) "had the ingenious idea of considering it, against any analogy, as an alkaline substance, and not as a

---

*temps qu'elle subit alors une modification résultante de sa combinaison avec une petite portion de l'alcali employé à sa précipitation.*

<sup>16</sup> Derosne (1803), p. 279 (UM). Originally, *un nouveau principe immédiat des végétaux.*

<sup>17</sup> Derosne (1803), p. 277 (UM). Originally, *ce sel est uni à une petite quantité de potasse, mais dans un état de combinaison imparfaite, et qui est plutôt savonneuse que saline, puisqu'il verdit le sirop de violette.*

<sup>18</sup> Séguin, *Annales de Chimie*, vol. 92, pp. 227-228 (UM). Originally, *D'où il résulte que cette substance cristalline ne peut être jusqu'ici considérée que comme une nouvelle matière végétale animale toute particulière.*

<sup>19</sup> Séguin (1814), p. 227 (UM). Originally, *ces cristaux ... acquiert de l'amertume et verdit légèrement le sirop de violette.*

<sup>20</sup> Séguin (1814), p. 245 (UM).

combination of the crystallizable material of Derosne with the ammonia."<sup>21</sup> Séguin (Courtois) had independently arrived at this conclusion in 1804.

In 1831, Henry included in his Elements of Experimental Chemistry one of Robinet's experiments with salt (*italics added*):

Robinet has applied, to the extraction of morphia from opium, his method of analyzing vegetable substances by saline solutions. He digests sliced opium in six times its weight of a solution of *common salt, sp. gr.* [specific gravity] *1.114*, and again with four times its weight of the same fluid. The liquids are united, and submitted to evaporation. *As soon as the salt begins to crystallize, a brown substance, fluid and seemingly resinous, swims on the surface of the liquor* the evaporation is continued to dryness, and the residue digested in *alcohol of sp. gr. 0.827*. After some hours digestion, the alcohol is decanted, and replaced by three fresh quantities of the same fluid in succession. Evaporation of the alcoholic liquid, by a water-bath, produces a mass slightly coloured, formed of small needles in mamillary groups. This mass is washed with a little alcohol, dried, and redissolved in hot water, from which, on cooling, a crystallized salt is deposited. The alcoholic and watery mother liquids united, and abandoned to spontaneous evaporation, give a further product of the same salt (*Ann. de Ch. et de Ph. xxx. 208*).<sup>22</sup>

Alcohol with a specific gravity of 0.827 corresponded to a solution of 86 to 88 percent alcohol at a temperature of between 60 and 68 degrees fahrenheit.<sup>23</sup>

An extract of the work of Robinet was published in the *Annales de Chimie et de Physique* in 1825: "The analysis of opium by saline solutions ought to present something of interest because one might hope to obtain the morphine in the state of combination in which it

---

<sup>21</sup> Robiquet. *ACP*, vol. 5, pp. 277-278. Originally, *a en l'ingénieuse idée de las considérer, contra toute analogie, et non pas comme une combinaison de la matière cristallisable de Derosne avec l'ammoniaque.*

<sup>22</sup> Henry, p. 258 (GB).

<sup>23</sup> Turner, Edward. "Table of Lowitz showing the Quantity of Absolute Alcohol in Spirits of different Specific Gravities," *Elements of Chemistry*. Fifth American edition. Philadelphia, PA: DeSilver, Thomas and Company, 1835, p. 660 (GB).

had existed in that substance."<sup>24</sup> In the opinion of the editor (Gay Lussac or Arago), "M. Robinet, using the known fact that salts mutually precipitate in their solutions, thought that they would also serve to dissolve certain vegetable principles while not acting on others."<sup>25</sup>

He began by dissolving opium in a solution of *sel marin* (italics added):

Some preliminary trials having recognized that a solution of sea salt, at 15 [degrees] of the aerometer of *Baumé*, dissolved the largest quantity of morphine, a certain weight of opium was macerated, cut in small pieces, in six times its weight of this solution. The opium became whitish and separated; kneading it helped this action. At the end of twelve hours, the liquor was filtered and the marc submitted again to the action of four parts of the saline solution. The two liquids had hardly any color; they were combined and submitted to evaporation. *At the same time as there began to be formed some crystals of sea salt, a brown substance was observed, fluid and resinous, swimming on the surface of the liquid, having been dissolved in totality in the water.* The evaporation was continued to dryness and alcohol at 38 [degrees] was added to this saline mass. The alcohol was lightly colored and after several hours of digestion, it was decanted and replaced successively by three new quantities of the same liquid. The evaporation by water-bath of the alcoholic liquors produced a lightly colored mass, formed of small needles collected together in heaps. This mass was washed with alcohol, dried and redissolved in hot water. Upon cooling, it recrystallized: this was the *salt of morphine*.<sup>26</sup>

<sup>24</sup> Robinet (1825), p. 210. Originally, *L'analyse de l'opium par les dissolvans salins devait présenter de l'intérêt, parce qu'on pouvait espérer d'obtenir la morphine dans l'état de combinaison où elle existe dans cette substance.*

<sup>25</sup> Robinet, S. "*Recherches sur l'Emploi des sels neutres dans les analyses végétales, et application de ce procédé à l'opium,*" *Annales de Chimie et de Physique*. Volume 30. Paris: Chez Crochard, 1825, p. 209. Originally, *M. Robinet, en partant du fait connu que les sels se précipitent mutuellement de leurs dissolutions, a pensé qu'ils pourraient aussi servir de dissolvant à quelques principes végétaux, et n'avoir pas d'action sur d'autres.*

<sup>26</sup> Robinet, S. *ACP*, vol. 30, pp. 210-211, italics Robinet for *sel de morphine*. Originally, *Des essais préliminaires ayant fait reconnaître qu'une dissolution de sel marin, à 15 [degrees] de l'aréomètre de Baumé, dissolvait la plus grande quantité de morphine, on fit macérer un certain poids d'opium, coupé*

Antoine Baumé (1728-1804) was a French chemist who (*italics added*):

established a manufactory for sal-ammonia, thereby rendering France independent of Egypt, whence previous supplies of the article had been procured. He improved the manufacture of porcelain, of scarlet dye for Gobelin tapestry, *invented the aerometer known by his name*, and greatly simplified and cheapened many processes in the useful arts. In 1773 he was elected a member of the Académie de Sciences and retired from business with a fortune in 1786.<sup>27</sup>

His "aerometer" is known more than two hundred years later as an hydrometer and is still used in the (*italics added*):

wine industry in both Australia and Europe, including France, as the [degrees] Bé of settled grape juice closely correlates to the potential alcohol, when the juice is fermented to dryness. *Other scales for hydrometry also exist and these include Bailing, Brix, Oechsle, Specific Gravity and Twaddle.*<sup>28</sup>

---

*en petits morceaux, dans six fois son poids de cette dissolution. L'opium devint blanchâtre et se divisa; on facilita encore l'action en le malaxant. Au bout de douze heures, la liqueur fut filtrée, et le marc soumis de nouveau à l'action de 4 parties de dissolution saline. Les deux liquides étaient très-peu colorés; ils furent réunis et soumis à l'évaporation. Dès qu'il commença à se former des cristaux de sel marin, on vit en même temps une substance brune, fluide et comme résineuse, surnager à la surface du liquide, pouvant se dissoudre en totalité dans l'eau; on continua l'évaporation à siccité, et on versa sur la masse saline de l'alcool à 38 [degrees]. L'alcool se colora légèrement, et après quelques heures de digestion, il fut décanté et remplacé successivement par trois nouvelles quantités du même liquide. L'évaporation au bain-marie des liqueurs alcooliques produisit une masse un peu colorée, fonnée de petites aiguilles réunies en mamelons. Cette masse fut lavée de l'alcool, séchée et redissoute dans l'eau chaude. Par le refroidissement, elle cristallisa de nouveau: c'était le sel de morphine.*

<sup>27</sup> Ripley, George and Charles A. Dana, editors. The New American Cyclopaedia, A popular Dictionary of General Knowledge. Vol. II. New York: D. Appleton and Company, 1859, p. 750 (GB).

<sup>28</sup> From [www.monashscientific.com.au/Baume.htm#Baume](http://www.monashscientific.com.au/Baume.htm#Baume).



### The hydrometer is an instrument

used to determine directly the *specific gravity* of a liquid. It usually consists of a thin glass tube closed at both ends, with one end enlarged into a bulb that contains fine lead shot or mercury to cause the instrument to float upright in a liquid. In the glass tube is a scale so calibrated that the reading on it level with the surface of the liquid in which the hydrometer is floating indicates the number of times heavier or lighter the liquid is than water, i.e., the specific gravity of the liquid. *The hydrometer is based on Archimedes' principle.* The level at which the hydrometer floats depends only on the *density* of the liquid.<sup>29</sup>

Specific gravity means (*italics added*):

the *relative weights of equal masses of matter.* It will be easily seen that all the various natural and artificial objects which come under our cognizance, have densities peculiar to themselves, i.e., equal bulks of them have very different weights; it becomes necessary, therefore, to have some standard which may be taken as unity, and to which the densities of all other bodies may be referred. ... [P]hilosophers have therefore agreed upon *water as the body to which all solids and liquids are to be compared*, and atmospheric air as the standard for gases.<sup>30</sup>

Finding the specific gravity of a particular liquid was as simple as filling a bottle with water and weighing it, filling the same bottle with the liquid to be compared and weighing that, and then comparing the two weights: "the bottle in use is generally made to hold 1000 grains of pure water, and then filling it with the fluid to be tried, the weight gives directly the specific gravity."<sup>31</sup> When a chemist got tired of weighing liquids, he fabricated his own hydrometer "which is an instrument in constant use in the

---

<sup>29</sup> Found at [www.questia.com/library/encyclopedia/hydrometer.jsp](http://www.questia.com/library/encyclopedia/hydrometer.jsp) quoting from the Columbia Encyclopaedia. Sixth edition. 2004. Columbia University Press.

<sup>30</sup> Williams, C. G. A Handbook for Chemical Manipulation. London: John Van Voorst, 1857, p. 83 (GB).

<sup>31</sup> Kane, Robert. Elements of Chemistry. Dublin: Hodges and Smith, 1842, p. 5 (GB).

laboratory to obtain densities without the necessity of weighing."<sup>32</sup> Popular hydrometers in use included those of Twaddell, Cartier, Baumé, Sykes, Gay-Lussac, and Tralles.<sup>33</sup> These results then needed to be compared to one another. Ure's Dictionary of Chemistry (1831) gives a table comparing the degrees obtained by using "Baumé's Hydrometer for Salts, Temperature 55 degrees Fahrenheit or 10 degrees Resumur" to the specific gravity: 15 degrees on the Baumé scale corresponds to a specific gravity of 1.114.<sup>34</sup> Turner (1835) gives the same comparison.<sup>35</sup> "Fifteen parts by weight of salt (NaCl) in 85 parts by weight of water (15%w/w) @ 12.5 degrees centigrade was the original definition of 15 degrees Baumé."<sup>36</sup>

Robinet further described his new salt:

*Salt of morphine.* This salt crystallizes with ease; it forms silky needles which, uniting in a common center, give birth to some heaps which have the greatest resemblance with certain flosculous flowers, such as those of the artichoke and thistle. These crystals are white and extremely bitter; they do not dissolve at all at the temperature of boiling water. Water, and especially alcohol, dissolves it easily; the water lets it recrystallize upon cooling. With alcohol one obtains crystals only by spontaneous evaporation. Ether does not affect it; heat decomposes it, and if it has contact with the air it burns without residue; the vapors which it gives off are ammoniacal.<sup>37</sup>

<sup>32</sup> Williams (1857), p. 90 (GB).

<sup>33</sup> Williams (1857), p. 90 (GB).

<sup>34</sup> Ure, Andrew. A Dictionary of Chemistry. Fourth edition. London: Thomas Tegg, 1831, p. 525 (GB).

<sup>35</sup> Turner, Edward. Elements of Chemistry. Fifth American edition. Philadelphia, PA: DeSilver, Thomas and Company, 1835, p. 661 (GB).

<sup>36</sup> From [www.monashscientific.com.au/concentration.htm#w/w](http://www.monashscientific.com.au/concentration.htm#w/w).

<sup>37</sup> Robinet, S. *ACP*, vol. 30, p. 214. Originally, *Sel de morphine. Ce sel cristallise avec facilité; il formes des aiguilles soyeuses qui, se réunissant toutes à un centre commun, donnent naissance à des mamelons qui ont la plus grand ressemblance avec certaines fleurs flosculeuses, telles que celles de l'artichaut et du chardon: ces cristaux sont blancs et extrêmement amers; ils ne fondent point à la température de l'eau bouillante. L'eau, et surtout l'alcool, le dissolvent avec facilité; l'eau le laisse cristalliser par le refroidissement; avec l'alcool on n'obtient des cristaux que par évaporation spontanée. L'éther est sans action sur lui; la chaleur le décompose, et s'il a le*

He extracted by evaporation more of his new salt from the alcohol and water he had used during the previous purification. Once this was separated out, "a crust of white material forms at the bottom of the evaporating dish which he recognized as meconate acid of soda."<sup>38</sup>

He next treated the marc with cold water. By repeated evaporations he received a little more of his salt of opium and the meconate. He treated it with alcohol and then ether and extracted the narcotine. Robinet also made up solutions of magnesium sulfate, water and opium which gave him the same results as the sea salt. In place of the magnesium sulfate he used solutions of potassium nitrate but saw no particular advantage in the latter.<sup>39</sup> Along the way he discovered a convenient test for morphine:

The proto-sulfate of iron offers no remarkable phenomenon; but the perchloride produced a very intense color blue, completely similar to that which would be obtained with a hydrocyanate. This curious property of producing blue was belonging to morphine in isolation.<sup>40</sup>

---

*contact de l'air, il brûle sans résidu: les vapeurs qui se dégagent sont ammoniacales.*

<sup>38</sup> Robinet, S. *ACP*, vol. 30, pp. 211-212. Originally, *il se forma au fond du vase évaporatoire une croûte de matière blanche, qui fut reconnue pour du méconate acide de soude.*

<sup>39</sup> Robinet, S. *ACP*, vol. 30, pp. 212-213.

<sup>40</sup> Robinet, S. *ACP*, vol. 30, p. 216. A perchloride is "a chloride having more chlorine than other chlorides of the same element" according to the American Heritage Dictionary of the English Language, Fourth Edition, copyright 2006 by Houghton Mifflin Company found at <http://dictionary.reference.com>. A chloride is "a salt of hydrochloric acid consisting of two elements, one of which is chlorine, as sodium chloride, NaCl" says Dictionary.com Unabridged (v. 1.1) based on the *Random House Unabridged Dictionary*, copyright 2006 Random House, found at <http://dictionary.reference.com>. The suffix *-ide* signifies binary compounds while *-ate* means a salt or ester as in chlorate, "a salt containing the anion ClO<sub>3</sub>." From the Compact OED, [www.askoxford.com](http://www.askoxford.com). Originally, *Le proto-sulfate de fer n'a offert aucun phénomène remarquable; mais le perchlorure a produit une couleur bleue très-intense, tout-à-fait semblable à celle qu'on aurait obtenue avec un hydrocyanate. Cette propriété curieuse de produire du bleu appartient à la morphine isolée.*

Robinet also experimented with lime. Small (1931) says that he noted the "solubility of morphine in *lime* water, but did not realize its phenolic nature"<sup>41</sup> (*italics added*):

Subsequently to the publication of the foregoing process, Robinet has communicated to the *Academie de Medecine* some new facts relative to the preparation of morphia. Having operated on the residue left by the action of *muriatic acid* on opium, and precipitated the morphia from the muriatic solution, *he passed a current of carbonic acid gas through the solution to precipitate the excess of lime*. This precipitate was found to be mixed with a very large proportion of morphia, separable, it is to be presumed, by the action of hot water. The washings of the precipitate being examined, were found free from morphia. At the same meeting, M. Henry observed, that from the experiments made at *La Pharmacie Centrale*, it appeared that much more morphia was obtained by those processes, in which *lime* had been used to precipitate morphia, than by those in which magnesia had been employed (Quart. Journ. N. S. ii. 216).<sup>42</sup>

The original notice in the *Journal de Pharmacie* reads (*italics added*):

M. Robinet reports that having treated different residues of opium by *muriatic acid*, and precipitated the morphine by *lime*, it appears that the excess of this last [the *lime*] retained morphine in the solution. In order to obtain it, *he passed through the liquid a current of carbonic acid gas* [carbon dioxide], he precipitated *lime carbonate* along with the morphine that he found easy to separate. M. Henry has also tried using *quicklime* in the treatment of opium in order to separate the morphine (*in place of magnesia or ammonia*). The remainder of the residues of opium, treated by one or the other of these procedures, have nearly as much morphine, but also narcotine which is removed very white by means of acetic acid.<sup>43</sup>

---

<sup>41</sup> Small (1931), p. 138 citing Robinet, *J. Pharm.* (2) 13, 24 (1827).

<sup>42</sup> Henry (1831), p. 258 (GB).

<sup>43</sup> Bouillon-Lagrange, P.-J., et al, editors. "*Section de Pharmacie*," *Journal de Pharmacie et des Sciences Accessories*, vol. 13. Paris: Chez Louis Colas, 1827, p. 24; found at <http://gallica.bnf.fr>. Originally, *M. Robinet annonce qu'ayant traité différens résidus d'opium par l'acide muriatique, et précipité la morphine par la chaux, il s'aperçut que l'excès de cette dernière retenait de la morphine en dissolution. Pour l'obtenir, il fit passer dans la liquide un*

Tomlinson (1850) explains muriatic acid: "This acid, formerly called *spirit of salt*, is now properly called hydrochloric acid, a name which indicates its chemical composition, namely, hydrogen and chlorine."<sup>44</sup> It had other names as well: "This compound exists naturally as a gas, of which a solution in water has been known since a very early period in chemistry under the names of spirit of salt, marine acid, muriatic acid, hydrochloric acid, and, more properly, chloride of hydrogen."<sup>45</sup> Chemists defined salt as a combination of hydrochloric acid and soda:

The muriate of soda, which is a compound of muriatic acid and soda, of all the other salts ... was the earliest known under the name of salt. It has been distinguished by the names of common salt, kitchen salt, sea-salt, and sometimes sal gem, rock salt.<sup>46</sup>

Ure (1831) gives an alchemical method of preparing muriatic acid (*italics added*):

It was prepared by the older chemists in a very rude manner, and was called by them Spirit of Salt. Muriatic was anciently extracted from common salt, by *igniting a mixture of it and soft clay kneaded up together*. Sir H. Davy first gave the just explanation of this decomposition. Common salt is a compound of sodium and chlorine. *The sodium may be conceived to combine with the oxygen of the water in the earth, and with the earth itself, to form a vitreous compound; and the chlorine to unite with the hydrogen of the water, forming muriatic acid gas.* ... *The muriates, when in a state of dryness, are actually*

---

*courant de gas acide carbonique, il se précipita du carbonate de chaux avec la morphine qu'il fut facile de séparer. M. Henry avait aussi essayé l'emploi de la chaux vive dans le traitement de l'opium pour séparer la morphine (au lieu de la magnésie ou de l'ammoniaque); au reste les résidus d'opium, traités par l'un ou l'autre de ces procédés, n'ont presque plus de morphine mais bien de la narcotine qu'on retire très-blanche par le moyen de l'acide acétique.*

<sup>44</sup> Tomlinson (1850), p. 6 (GB).

<sup>45</sup> Kane (1842), p. 500 (GB).

<sup>46</sup> Encyclopaedia Britannica; Or a Dictionary of Arts, Science, and Miscellaneous Literature. 6th edition. Vol. V. Edinburgh: Archibald Constable and Co., 1823, p. 568 (GB).

*chlorides*, consisting of chlorine and the metal; yet they may be conveniently treated of under the title muriates.<sup>47</sup>

Gay-Lussac observed the natural production of hydrochloric acid at the sites of volcanoes where sea-water was subjected to great heat. Seeking to explain how exactly it was formed, he did the following experiments (*italics added*):

M. Thenard and I have already shown, that, if perfectly dry sea-salt and sand are both heated red-hot, no hydrochloric acid is evolved; we found, also, that sea-salt undergoes no alteration from the agency of water alone; but, if *aqueous vapour* is suffered to pass over a mixture of sand, or of clay with sea-salt, hydrochloric acid is immediately disengaged in great abundance.<sup>48</sup>

Tilgeman (1848) demonstrated the effect of steam on a number of different chloride salts to produce hydrochloric acid (*italics added*):

The chloride of magnesium offers a striking instance of such an action, being almost entirely reduced to magnesia, with escape of hydrochloric acid, when its solution is evaporated by a strong heat ... Even chloride of calcium, a salt of much stronger radical base, has been observed to give off a portion of acid, when all its water of crystallization is driven off by a red heat. ... *Contact of the salt and water, at high temperatures, appears to be the only requisite of decomposition.* ... [A]lso the chlorides of strontium and barium could be rapidly decomposed by exposing them, at a high red heat, to a current of steam; hydrochloric acid was copiously evolved and escaped along with the excess of steam, while the bases of the respective salts were left in a free state; the lime remaining anhydrous from the intensity of the heat employed .... [T]he addition of the element of *water is absolutely essential* to the decomposition; as neither the hydrogen which is contained in the acid, nor the oxygen in the base, existed in the anhydrous salt. The action is, therefore, the

---

<sup>47</sup> Ure (1831), p. 67-68 (GB).

<sup>48</sup> Gay-Lussac. "Reflections on Volcanoes," a paper read before the Royal Academy of Sciences at Paris and published as "Theory of Volcanoes" in *The Monthly Magazine or British Register*. Vol. LX. Part Two. London: George B. Whittaker, 1825, p. 497 (GB).

result of a *double decomposition* between the *steam* and the *chloride*, as well as of the affinity of the liberated acid and bases for water.<sup>49</sup>

In the early 19th century, this well-known affinity of the chlorine in the chloride salts for hydrogen was exploited using sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) in a process for making hydrochloric acid without using heat (*italics added*):

Muriatic acid. - Is formed when equal volumes of chlorine and hydrogen are mixed and exposed to light, flame, or the electric spark, all of which cause the gases to combine with explosion. *Is best prepared by the action of sulphuric acid on sea salt, when the gas is disengaged even without the aid of heat. As water instantly absorbs it .... It will be readily seen, that the action of hydrochloric acid on oxides* affords a ready and convenient means of obtaining the corresponding *chlorides*.<sup>50</sup>

Ure (1831) provided a recipe and an explanation for the sulfuric acid method (*italics added*):

Let six parts of pure and well dried sea salt be put into a glass retort, to the beak of which is luted, in a horizontal direction, a long glass tube artificially refrigerated, and containing a quantity of *ignited muriate of lime* [calcium chloride]. Upon the salt pour at intervals five parts of concentrated oil of vitriol [sulfuric acid], through a syphon funnel fixed airtight in the tubulure of the retort. The free end of the tube being recurved, so as to dip into the mercury of a pneumatic trough, a gas will issue, which, on coming into contact with the air, will form a visible cloud, or haze, presenting, when viewed in a vivid light, prismatic colours. This gas is muriatic acid. ... [T]he water of the oil of vitriol is first decomposed, *its oxygen unites to the sodium to form soda*, which is seized on by the sulphuric acid, while the *chlorine combines with hydrogen of the water*, and exhales in the form of muriatic acid gas.<sup>51</sup>

---

<sup>49</sup> Tilgeman, Richard. "Decomposing Power of Water at High Temperatures," *The Civil Engineer and Architect's Journal* published in the *Scientific and Railway Gazette*. vol. XI. London: R. Groombridge and Sons, 1848, p. 181 (GB).

<sup>50</sup> Gregory (1845), vol. 1, p. 71 (GB).

<sup>51</sup> Ure (1831), pp. 64, 67 (GB).

Because of the manner in which Robinet had obtained his new salt, the acid separated from it displayed different properties from Sertuerner's meconic acid. For this reason Robinet had doubts as to whether or not the morphine was united with meconic acid in the original opium. He described his new acid but did not name it:

M. Pelletier has proposed to call it *codeic acid*, from *codè*, the head of the poppy. The morphine has received from M. Chaussier the name of *narcéine*, which M. Robiquet prefers; and as these denominations might give place to some confusion in pharmacy, M. Robinet assures us that one will be sure to be understood when writing *sedative salt of Robinet*.<sup>52</sup>

## B. SALT, LIME AND PELLETIER AND GUIBOUT

Robinet's results were controversial and needed to be confirmed. A number of other French chemists including Pelletier (1788-1842) and Guibourt (1790-1867)<sup>53</sup> reviewed his work. Pelletier isolated narceine in 1832 and pseudomorphine aka "oxymorphine, oxydimorphine, dihydromorphine, or phormin"<sup>54</sup> in 1835. Also in 1835, Pelletier experimented with a *lime* treatment of 5 kilograms of opium by Thiboumery, the manager of his factory.<sup>55</sup> With Thiboumery, he isolated thebaine ("the last alkaloid formed by the growing plant") that same year.<sup>56</sup> With Thiboumery and Mohr he is credited with one of the three classic processes for extracting morphine from opium. Guibourt collaborated in the publishing of the *Journal de Chimie Médicale*. In 1820 he published the Natural History of Simple Drugs and with Henry *père* a textbook on pharmacy in 1828. With Henry *fils* he operated the Central Pharmacy for the hospitals in Paris.<sup>57</sup>

---

<sup>52</sup> Robinet, S. *ACP*, vol. 30, p. 216.

<sup>53</sup> Hoefer, director. *Nouvelle Biographie Générale*. Vol. 22. Paris: Didot Frères, Fils et Cie., 1858; [www.biup.univ-paris5.fr/dossier%20biographique.htm](http://www.biup.univ-paris5.fr/dossier%20biographique.htm).

<sup>54</sup> Small, pp. 81, 170.

<sup>55</sup> Barbier (1950), p. 1.

<sup>56</sup> Small, p. 290.

<sup>57</sup> Morson, *Operative Chymist*, p. 29 (GB).



Regarding the paper of Robinet, Pelletier and Guibourt made a report to the *Académie Royale de Médecine*:

M. Robinet, noticing that organic substances are altered by the majority of chemical agents, reduced to a very small number those agents that can be employed in vegetable analysis without exercising upon them some elementary affinity which would change their nature; M. Robinet calls the attention of the Pharmacy Section to the modifications that the neutral salts produce by dissolving them in water with vegetable materials.<sup>58</sup>

Their review of the work of Robinet was translated and published in the *Edinburgh Journal of Medical Science* (1826):

The first part of this Report is confined to the examination of the fact, that the power of water as a solvent of vegetable matters, is greatly modified by the presence of neutral salts. Thus colouring matters are less soluble in water containing muriate of soda [sodium chloride] in solution, than in pure water: for example, cochineal communicate scarcely a pink tint to such a solution, and madder only a slight yellow: whilst the saline matters of the vegetable bodies are readily taken up by it. M. Robinet has applied this principle to the analysis of opium ....<sup>59</sup>

---

<sup>58</sup> Pelletier, J. and Guibourt. "Rapport de MM. Pelletier et Guibourt, sur un mémoire ayant pour titre: Recherches sur l'emploi des sels neutres dans les analyses végétales et application de cette méthode à l'opium, par M. Robinet," *Journal de Pharmacie et des Sciences Accessoires*, vol. 11. P.-J. Bouillon-Lagrange, et al., editors. Paris: Chez Louis Colas Fils, 1825, p. 366.

Originally, *M. Robinet, partant de ce point que l'altérabilité des substances organiques par la plupart des agens chimiques, réduit à un très-petit nombre ceux de ces agens qu'on peut employer dans l'analyse végétale pour séparer les principes immédiats sans exercer sur eux d'affinité élémentaire qui changerait leur nature; M. Robinet appelle l'attention de la section sur les modifications que la présence des sels neutres produit dans l'action dissolvante de l'eau sur les matières végétales.*

<sup>59</sup> "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 199 (GB).

In their analysis of his work, they also recorded his separation of elements in a bath of sea salt and water at ambient temperature (*italics added*):

M. Robinet treats the opium at the ordinary temperature of the atmosphere in two stages, the first by a solution of sea salt at 15 [degrees] density, in the proportion of six parts of solution against one part of opium, in the second by four parts of solution. The filtered liquors are then evaporated. *At the moment when the sea salt begins to be deposited one sees a brown oily matter floating. This is the combination of the morphine contained in the opium with the acid which saturates it.* It is possible to draw it off at this point; but it is preferable to evaporate the liquid in order to obtain all the material that is held in solution and which is presented in the form of a saline mass.<sup>60</sup>

The English translation of their report in the *EJMS* also contained a description of Robinet's experiment with sea salt (*italics added*):

The first step of M. Robinet's method of analysis is, to treat one part of opium with six parts of a solution of sea salt of 15 [degrees] of density, and afterwards with four parts of a similar solution, at the ordinary temperature of the atmosphere. The filtered liquid is then evaporated; and when the muriate of soda [sodium chloride] begins to be deposited, *a brown oily matter floats on the surface, which is a compound of morphia and the acid which saturates it, in its natural state in the opium.* This may be skimmed off; but it is preferable to evaporate the liquid to dryness.<sup>61</sup>

---

<sup>60</sup> Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, p. 370. Originally, *M. Robinet traite l'opium à deux reprises par une solution de sel marin à 15 [degrees] de densité, dans la proportion de six parties de solution contre une d'opium pour la première fois, et quatre parties pour la seconde à la température ordinaire de l'atmosphère. Les liqueurs filtrées sont alors mises à évaporer. Au moment où le sel marin commence à se déposer on voit surnager une matière brune huileuse. C'est la combinaison de la morphine contenue dans l'opium avec l'acide qui la sature. On pourrait dès lors l'enlever; mais il est préférable d'évaporer le liquide pour obtenir toutes les matières qu'il tenait en dissolution et qui se présentent sous forme de masse saline.*

<sup>61</sup> "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, 'Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet,'" *Edinburgh Journal of*

After soaking it in alcohol three or four times, the alcohol was evaporated to a syrup and set aside to crystallize. Two days later "papillary and needle formed crystals are procured. These are to be drained, washed with a little alcohol, redissolved in a sufficient quantity of boiling water, and crystallized anew."<sup>62</sup>

Pelletier and Guibourt notice that Robinet seemed to have obtained a sodium meconate, implying a new and separate acid for the morphine:

A remarkable thing that we can say without interrupting the analytical narrative is that the meconic acid in opium is united to the soda, while the acid which saturates morphine, and upon which we will return later, is of a completely different nature.<sup>63</sup>

They followed his work with the marc:

After having thus proceeded with the separation of the principles of opium soluble in salt water, M. Robinet returned to the marc of opium, which is to say the part of the opium not dissolved by the saline solution. He treated the marc of opium successively with water, cold alcohol, boiling alcohol and ether. By the water he obtained again a certain quantity of the salt of morphine and of the acidulous meconate of soda. ... By the ether finally M. Robinet obtained narcotine, mixed at first with an oily substance. One can separate these two materials by new dissolutions in ether; the narcotine crystallizes upon cooling.<sup>64</sup>

---

*Medical Science*. Vol. I, Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 199 (GB).

<sup>62</sup> "Report," *EJMS*, vol. 1, p. 200 (GB).

<sup>63</sup> Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, p. 371. Originally, *Une chose remarquable que nous pouvons dire sans interrompre l'exposé de la marche de l'analyse, c'est que l'acide méconique dans l'opium est uni à la soude, tandis que l'acide que sature la morphine, et sur lequel nous reviendrons, est de toute autre nature.*

<sup>64</sup> Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, p. 371-372. Originally, *Après avoir ainsi procédé à la séparation des principes de l'opium dissous dans l'eau salée, M. Robinet revient au marc d'opium, c'est-à-dire à la partie de l'opium non dissoute par la solution saline. Il traite successivement le marc d'opium par l'eau, par l'alcool froid, par l'alcool bouillant et par l'éther. Par l'eau il en retire encore une certaine*

One of Robinet's results showed that not only did the known alkalis dissolve morphine from opium but that the alkaline-earths could do this also, in particular lime. Séguin (Courtois) did not derive this explicitly in his experiments but it was certainly implied.<sup>65</sup> Pelletier and Guibourt thought it was significant (*italics added*):

A very important point for the history of morphine is its solubility in the mineral alkalis. It is well known that an excess of ammonia or of potash redissolves morphine. M. Robinet has demonstrated that the solubility of morphine in the alkalis was greater than had been thought; that this solubility extends to baryta and to *lime*; that some of these combinations crystallize ....<sup>66</sup>

The two chemists are using the term "alkali" broadly but the same was pointed out by J. B. Ps. in the 1965 *Britannica*:

Alkali. In modern chemistry the term alkali is specifically applied to the very soluble hydroxides of lithium, sodium, potassium, rubidium and cesium which are known as the alkali metals. ... The term is shared by the less soluble hydroxides of the alkaline earth metals, calcium, strontium and barium .... Industrially the term is extended to include other compounds which are soluble and which behave actively as bases.<sup>67</sup>

---

*quantité de sel de morphine et de méconate acide de soude. ... Par l'éther enfin M. Robinet obtient la narcotine, mêlée d'abord avec une substance huileuse. On peut séparer ces deux matières par de nouvelles dissolutions dans l'éther, la narcotine cristallisant par le refroidissement.*

<sup>65</sup> Séguin, Armand. "Premier Mémoire sur l'Opium," *Annales de Chimie*. Volume 92. Paris: Chez Crochard, 1814, pp. 232-234.

<sup>66</sup> Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, p. 376. Originally, *Un point très-important pour l'histoire de la morphine c'est sa solubilité dans les alcalis minéraux. On savait bien qu'un excès d'ammoniaque ou de potasse redissolvait la morphine. M. Robinet a montré que la solubilité de la morphine dans les alcalis était plus grande qu'on ne l'avait pensé; que cette solubilité s'étendait à la baryte et la chaux; que quelques-unes de ces combinaisons cristallisent ....*

<sup>67</sup> J. B. Ps. "Alkali," *Encyclopaedia Britannica*. Vol. 1. Chicago, IL: William Benton, 1965, p. 636.

As for Robinet's contention that Sertuerner's meconic acid was not combined in the opium with the morphine, Pelletier and Guibourt suggested a test:

M. Robinet, having found, as we have said, that the salt of morphine from which the morphine had been separated did not contain meconic acid, he threatened to conclude, against the assertion of Sertuerner, that the meconic acid which already exists in opium is not combined with morphine but with soda. It seems to us, the opinion of M. Robinet appears very probable but not rigorously demonstrated. ... For all of that it will suffer M. Robinet to put a note in his memoir if, when he has substituted nitrate of potass or sulfate of magnesium for the muriate of soda to obtain the salt of morphine, he has also obtained the meconate of soda, a thing that we have not found expressed in a positive manner in his memoir.<sup>68</sup>

In the *EJMS* this paragraph appeared translated as:

M. Robinet, having found, as we have already stated, that the salt of morphia, from which it is separated, contains no meconic acid, is justified in concluding, contrary to the assertion of Sertuerner, that the meconic acid which exists in opium is not combined with morphia but with soda. This opinion of M. Robinet appears to us very probable, but not rigorously demonstrated. ... If M. Robinet, substituting nitrate of potass and sulphate of magnesia, for muriate of soda, to procure the salt of morphia, obtains the meconate of soda, we shall think that the fact is established.<sup>69</sup>

---

<sup>68</sup> Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, pp. 373-374. Originally, *M. Robinet ayant trouvé, ainsi que nous allons le dire, que le sel de morphine dont il a été séparé ne contient pas d'acide méconique, il est amené à en conclure, contre l'assertion de Sertuerner, que l'acide méconique qui existe bien dans l'opium n'y est pas combiné avec la morphine mais bien avec la soude. Quant à nous, l'opinion de M. Robinet nous paraît très probable, mais non pas rigoureusement démontrée. ... Du reste il suffira à M. Robinet de mettre en note à son mémoire si, lorsqu'il a substitué le nitrate de potasse et le sulfate de magnésie au muriate de soude pour obtenir le sel de morphine, il a aussi obtenu du méconate de soude, ce que nous n'avons pas trouvé exprimé d'une manière positive dans son mémoire.*

<sup>69</sup> "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, 'Researches on the employment of Neutral Salts in the analysis of Vegetables, and the

On the assumption he was correct, Pelletier and Guibourt then asked:

But what is the acid which saturates morphine in the opium? ... The author, in his memoir, has not denominated this acid. We will propose to him to call it *codeic acid*, from *codé*, head of the poppy. The natural combination in opium would then be the *codeate of morphine*.<sup>70</sup>

A translation of the work of Orfila and Olivier was published describing a series of experiments on dogs with the not yet rigorously demonstrated codiate of morphia in the *EJMS* later that year:

Injection into the Veins. - A grain of codiate of morphia, dissolved in a small quantity of water, being injected into the jugular vein of a little dog, the animal uttered some lamentable cries, during the injection, and fell presently into a sort of somnolency, which disappeared gradually after some hours. Two grains dissolved in distilled water, injected into the jugular vein of a large sized and pretty strong dog, besides occasioning some cries during the act of injection, soon reduced the animal to a quiet state, and thence to sleepiness, in which he remained about three hours: the narcotism went off insensibly.<sup>71</sup>

They tried three grains, and then six grains in the same way with the same results. They injected twelve, eighteen and then thirty-six grains into the thighs of three other dogs and caused ever increasing, prolonged and deeper sleep. The latter dose also caused

---

application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 201 (GB).

<sup>70</sup> Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, p. 375. Originally, *Mais quel est l'acide qui sature la morphine dans l'opium?* ... *L'auteur, dans son mémoire, n'a pas dénommé cet acide. Nous lui proposerons de l'appeler acide codéique, de codé, tête de pavot. La combinaison naturelle dans l'opium serait alors le codéate de morphine.*

<sup>71</sup> Orfila and Olivier. "Of the action of Codiate of Morphia, upon the animal economy; a series of experiments by MM. Orfila, and Olivier of Angers. - From the *Journal de Chimie Medicale*, Oct. 1825," *The Edinburgh Journal of Medical Science*, Vol. II. July 1, 1826 to January 1, 1827. Edinburgh: Maclachlan and Stewart, 1826, pp. 120-121 (GB).

convulsions. With forty-five grains "the convulsive motions, having become so strong as to raise the whole trunk, destroyed the life of the animal at half past ten, two hours and eighteen minutes after the introduction of the codiate of morphia into the cellular tissue of the thigh."<sup>72</sup> The authors concluded:

We will merely observe, that, comparing the results of our experiments with those obtained from the use of the acetate of morphia in equal doses, it turns out that the codiate of morphia, in high doses, has produced all the phenomena presented in animals poisoned by the acetate. By the examination of the symptoms, however, which have taken place under the use of the codiate of morphia in small doses, would we not be led to suspect that this natural salt may possess a property somewhat more sedative than the other preparations of opium? Let us wait until the trial of this new medicine on man clear up so important a question.<sup>73</sup>

Pelletier and Guibourt, Orfila and Olivier analyzed and tested this newly obtained sedative salt; but what exactly it was composed of was not yet clear.

### C. SALT, MAGNESIA, LIME AND ROBIQUET

Pierre Jean Robiquet (1780-1840), who lectured at the *École Supérieure de Pharmacie*, is credited with the extraction and isolation of asparagine from asparagus, orsine and variolarin from lichens, as well as cantharadine, amygdaline, and purpurine.<sup>74</sup> His analytical methods were known for their delicacy, finesse, exactitude and originality and he joined the *Académie des Sciences* in 1834.<sup>75</sup>

<sup>72</sup> Orfila and Olivier (1826), pp. 121-123 (GB).

<sup>73</sup> Orfila and Olivier (1826), p. 123 (GB).

<sup>74</sup> From [http://fr.wikipedia.org/wiki/Pierre\\_Jean\\_Robiquet](http://fr.wikipedia.org/wiki/Pierre_Jean_Robiquet); *Biographie Universelle, Ancienne et Moderne Supplément*. Vol. 79, "R." Paris: L.-G. Michaud, 1846, 256-257 (GB).

<sup>75</sup> [Http://fr.wikipedia.org/wiki/Pierre\\_Jean\\_Robiquet](http://fr.wikipedia.org/wiki/Pierre_Jean_Robiquet); *Biographie Universelle, Ancienne et Moderne Supplément*. Vol. 79, "R." Paris: L.-G. Michaud, 1846, 256-257 (GB).

Among other achievements, he "was famous for his improvements to opiate alkaloid processes."<sup>76</sup> He was competitive and quick to verify and correct the work of other scientists. He verified the results of Serturner in 1817:

Gay-Lussac very properly committed to Robiquet the important duty of investigating and substantiating the fact thus announced by the German chemist. To no individual could such a task have been entrusted, whose capability and judgment would be more appreciated than Robiquet.<sup>77</sup>

In the same year he extracted and isolated narcotine, which can be "separated by precipitation with ammonia and purification of the precipitate with alcohol."<sup>78</sup> Robiquet is also credited with first having isolated narcotine "by exhaustive extraction with ether"<sup>79</sup> though both Derosne and Séguin may have done so roughly with water and alcohol more than a decade earlier. He continued investigating the properties of morphine and in 1832 was the first to isolate the methyl ether of morphine, codeine, discovering it "as an impurity accompanying morphine which had been extracted from opium by the Gregory process."<sup>80</sup>

While reviewing the results of Sertuerner in 1817, Robiquet, because of his doubts as to the influence of the alkalis on the morphine, repeated Sertuerner's experiment, this time precipitating it with something less energetic than ammonia, magnesia (*italics added*):

I retained some doubts as to the existence of morphine as an alkali, I wished first to be sure of its nature and, perceiving that in treating it with a warm solution of concentrated caustic potash there were some traces of ammonia, I looked for a means of obtaining it independently of any energetic base. *I chose*

---

<sup>76</sup> Morson, Anthony. *Operative Chymist*. Amsterdam: Rodopi, 1997, p. 30 (GB).

<sup>77</sup> "Materia Medica and General Therapeutics," *The American Journal of the Medical Sciences*. Vol. XXI. Philadelphia, PA: Carey, Lea and Blanchard, 1837, p. 479 (GB).

<sup>78</sup> Morson, p. 83 (GB).

<sup>79</sup> Small, p. 42, 138.

<sup>80</sup> Small, p. 174.



*by preference magnesia, which perfectly succeeded; by its intermediation one obtains morphine nearly without color from the first crystallization.*<sup>81</sup>

Henry (1831) describes one of Robiquet's experiments with opium and magnesia (*italics added*):

A better method of separating morphia (than that of Serturmer), proposed by Robiquet, and, I believe, the one most commonly practiced, is as follows: A concentrated solution of a pound of opium in water is to be boiled with 100 grains of *pure magnesia*, during a quarter of an hour. A greyish deposit is formed in considerable quantity, which is to be washed first with cold water, and next with hot and weak alcohol, which takes up a small quantity of morphia and much colouring matter. It is afterwards washed with a little cold and concentrated alcohol, and then boiled in a sufficient quantity of the same fluid, which, at that temperature, dissolves morphia. On cooling, morphia is deposited a little coloured; but by repeating the operation three or four times, it may be obtained colourless, and crystallized in regular parallelopipeds, with oblique forms.<sup>82</sup>

In place of magnesia, it was possible to substitute lime (*italics added*):

M. Robiquet gives the following method, used by M. Tilloy, a pharmacist from Dijon, *to extract morphine from indigenous poppies*. Prepare an aqueous extract with the heads of the poppies. Treat this extract with alcohol in order to isolate the gum. Separate the alcohol from the solution by distillation and bring the remaining liquor to the consistency of a syrup. Repeat this a second time with some potassium nitrate and alcohol to precipitate a new quantity of gum. Distill off the alcohol. Dissolve the residue from this distillation in water and filter it to separate the resin. Next, precipitate the filtered liquor with *magnesia* (1) and let it rest 24 hours. Collect the precipitate with a filter,

---

<sup>81</sup> Robiquet. *ACP*, vol. 5, p. 279. Originally, *Je conservais quelques doutes sur l'existence de la morphine comme alcali, je voulus d'abord m'assurer de sa nature, et m'étant aperçu qu'elle donnait quelques traces d'ammoniaque en la traitant à chaud par une solution concentrée de potasse caustique, je cherchai à l'obtenir, indépendamment de toute base énergique : je choisis de préférence la magnésie, qui m'a parfaitement réussi; par son intermède, on obtient la morphine presque incolore dès la première cristallisation.*

<sup>82</sup> Henry, pp. 257-258 (GB).

wash it and let it dry; then treat it with boiling alcohol which dissolves the morphine, and deposits it upon cooling. Separate out the morphine by means of a filter. Collect the mother liquors which still retain some morphine. (1) According to M. Tilloy, one can use the sub-carbonate of soda (in order to saturate the excess of acid and to economize the calcined magnesia) or even the sub-carbonate of magnesia or that of *lime*.<sup>83</sup>

Robiquet examined, reanalyzed, and corrected part of the work of Robinet and published his results in 1826. Like others, he still had some doubts on the alkalinity of this new base because of the processes previously used to extract it from opium (*italics added*):

As is known, I have more than once expressed some *doubts on the preexistence of organic alkalis in vegetables* and I had supposed that they were the *products of the reaction with the alkaline substances upon certain immediate materials*, more particularly upon that which is called the resinous principle or resinoid. I had thought then that the alkalinity acquired by this principle was due to the combination of a certain quantity of ammonia, the existence of which I had recognized in all the vegetables which have organic bases. From this point of view, the action of potash, *lime*, magnesia or other analogous bases was reduced to decomposing an already formed ammoniacal salt and combining that base in appropriate proportion with the

<sup>83</sup> Robiquet, "Section de Pharmacie," *Journal de Chimie, Médicale, de Pharmacie et de Toxicologie*, vol. 3. Paris: Chez Béchet Jeune, 1827, pp. 97-98 (GB). Originally, *M. Robiquet donne communication du procédé suivant, employé par M. Tilloy, pharmacien à Dijon, pour extraire la morphine des pavots indigènes: On prépare un extrait aqueux avec les têtes de pavots; on traite cet extrait par l'alcool, pour en isoler la gomme; on sépare la solution alcoolique, que l'on soumet à la distillation pour en retirer l'alcool; on amène la liqueur en consistance sirupeuse; on reprend une deuxième fois, par l'alcool qui précipite une nouvelle quantité de gomme mêlée à du nitrate de potasse; on distille pour obtenir l'alcool; on dissout dans l'eau le résidu de la distillation; on filtre pour séparer la liqueur filtrée par la magnésie (1); on laisse en repos pendant vingt-quatre heures; on recueille le précipité sur un filtre, on le lave, on le fait sécher; puis on le traite par l'alcool bouillant qui dissout la morphine, et la dépose en refroidissant; on la sépare au moyen du filtre; on recueille les eaux mères qui retiennent encore de la morphine. (1) Suivant M. Tilloy, on pourrait employer le sous-carbonate de soude pour saturer l'excès d'acide et économiser la magnésie calcinée, ou encore le sous-carbonate de magnésie ou celui de chaux.*

resinous principle which I have mentioned. I founded this opinion on the presence of nitrogen in all the vegetable alkalis ....<sup>84</sup>

Others had similar doubts as to just what acid the morphine was combined with in its natural state. Sertuerner thought it was meconic acid but not everyone was so sure. A review of Brande's Manual of Chemistry (1825) encapsulates the argument:

Our author has given a very full and satisfactory account of *Opium*, and has questioned the accuracy of the combination of *morphia* with the *meconic* acid, in its natural state, in opium. He has not, however, assigned any reasons for his doubts, which, indeed, extend to the existence of the meconic acid itself; but his doubt, as to the meconate being the form in which morphia is contained in opium, has lately, also, occurred to a French chemist of the name of Robinet, who supposes that he has ascertained by experiment, that, although the meconic acid exists in opium, yet it is not combined with morphia, but with soda; the morphia being combined with another acid, *sui generis*, which, under the supposition of its existence, was termed the *Codeic*, by Pelletier. From the character of it given by Robinet, it differed essentially from the meconic. The sedative principle of opium, therefore, were Robinet's experiments confirmed, would be a codiate of morphia ....<sup>85</sup>

---

<sup>84</sup> Robiquet. "Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*, vol. 12. Paris: Chez Louis Colas Fils, 1826, p. 68. Italics Robiquet for *principe résineux* and *résinoïde*.

Originally, *J'ai plus d'une fois, comme on sait, émis quelques doutes sur la préexistence des alcalis organiques dans les végétaux, et j'ai supposé qu'ils étaient produits par la réaction des substances alcalines sur certains matériaux immédiats, et plus particulièrement sur ce qu'on nomme le principe résineux ou résinoïde. J'admettais encore que l'alcalinité acquise par ce principe était due à la combinaison d'une certaine quantité d'ammoniaque dont j'avais reconnu l'existence dans tous les végétaux qui fournissent des bases organiques. Ainsi donc, dans cette manière de voir, l'action de la potasse, de la chaux, de la magnésie ou autres bases analogues, se réduisait à décomposer un sel ammoniacal tout formé, et à combiner cette base en proportion convenable avec le principe résineux dont j'ai fait mention. J'avais fondé cette opinion sur la présence de l'azote dans tous les alcalis végétaux ....*

<sup>85</sup> "Article XXVIII. - A Manual of Pharmacy. By William Thomas Brande, 1825, pp. 556," *Edinburgh Journal of Medical Science*. Vol. I. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 184 (GB).

The editors of the *EJMS* repeated Robinet's experiment with sea salt (*italics added*):

Impressed with the singular results of the foregoing analysis, and the importance of procuring morphia in the state in which it exists in opium, we were induced to repeat the experiments of M. Robinet, and obtained, in our analysis, a salt, *which had so many of the characters of a muriate*, that we were inclined to think, that, by some mismanagement in the manipulation, we had not been able to separate entirely the muriate of soda, although the crystals which we obtained were repeatedly dissolved and recrystallized.<sup>86</sup>

The authors then did some basic tests with silver nitrate and sulfuric acid: "These tests were sufficient to convince us that muriatic acid was present in the salt we had procured, as the codiate of morphia; but we were undecided as to its origin ...."<sup>87</sup>

Like Pelletier and Guibourt, Robiquet (who was still doubting the alkaline nature of morphine) was initially persuaded by the first part of the work of Robinet:

I was still of this opinion when M. Robinet announced that, with the aid of a new means of analysis which he put at the disposal of the chemists, he had managed to isolate the natural salt of morphine from all the other products contained in opium; after which I regarded the problem as resolved and I was one of the first to applaud the success of our young and estimable colleague; but who has not known how difficult it is to throw off ideas so long admitted as true.<sup>88</sup>

---

<sup>86</sup> "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 202 (GB).

<sup>87</sup> "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 202 (GB).

<sup>88</sup> Robiquet. "Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*, vol. 12 (1826), p. 70. Originally, *J'étais encore dans cette persuasion lorsque M. Robinet nous annonça qu'à*

Yet something nagged at him and at the first opportunity he repeated Robinet's experiment, first soaking the opium in a solution of sea salt. Like Robinet, he observed the separation (*italics added*):

I macerated a kilogram of opium in a sufficient quantity of water, and after having returned all the reunited solutions to around 7 [degrees] of the aerometer, I added to it *sea salt* in powder, and I stirred the liquid until it was completely *saturated*. After some moments of contact, I saw *a sticky black material which was precipitated abundantly and which plastered all the inner walls of the flask*.<sup>89</sup>

Saturation, reports Ure in 1831 (*italics added*):

in a saline solution of an invariable temperature, is the point at which the solvent, always in contact with the salt, *can neither take up any more, nor let go any more*. ... The determination of the quantity of salt which water can dissolve, is not a very difficult process. It consists in saturating the water exactly with the salt whose solubility we wish to know at a determinate temperature, to weigh out a certain quantity of that solution, to evaporate it, and weigh the saline residue. ... We obtain a perfectly saturated saline solution in the two following ways: - By heating the water with the salt, and allowing it to cool to the temperature whose solubility is wanted; or by putting into cold water a great excess of salt, and gradually elevating the temperature. In each case, it is requisite to keep the final temperature constant for two hours at least, and *to stir the saline solution frequently*, to be quite sure of its

---

*l'aide du nouveau moyen d'analyse qu'il venait de mettre à la disposition des chimistes, il était parvenu à isoler le sel naturel de morphine de tous les autres produits contenus dans l'opium; dès-lors je regardai le problème come résolu, et je fus un des premiers à applaudir au succès de notre jeune et estimable confrère; mais qui ne sait combien on éprouve de peine à se débarrasser d'idées long-temps admises comme vraies.*

<sup>89</sup> Robiquet. "Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*, vol. 12 (1826), pp. 70-71.

Originally, *Je fis macérer un kilogramme d'opium dans une quantité suffisante d'eau, et après avoir ramené toutes les solutions réunies à environ 7 [degrees] de l'aréomètre, j'y ajoutai du sel marin en poudre, et j'agitai le liquide jusqu'à sa complète saturation. Après quelques instans de contact, je vis une matière poisseuse noirâtre qui se précipita en assez grande abondance, et qui vint enduire toutes les parois internes du vase.*

perfect saturation. By direct experiments, made with much care, M. Gay-Lussac ascertained that these two processes give the very same result, and that of consequence they may be employed indifferently.<sup>90</sup>

Having saturated his solution with sea salt and obtained a separation, Robiquet next precipitated the morphine with ammonia:

When the action was completely finished, I filtered the liquid and boiled it. At this point I added an appropriate quantity of ammonia; I retired it from the fire and I received, after cooling, the precipitate which had formed; but I saw that the proportion was much less than the ordinary method ... and I obtained hardly four grams of morphine.<sup>91</sup>

He returned to his solution of sea salt and ammonia and noticed that it had precipitated again while it was cooling. He purified this new precipitate (*italics added*):

Examined in its crude state, I took it first for a meconate ... but it was only after the complete purification that I could state its true nature and recognize that it was a muriate of morphine. *It would be impossible to understand this result without admitting that the hydrochloric acid had been furnished by the sea salt* .... from which it must be inferred, against the advice of M. Robinet, against my own opinion, but conforming with the original idea put forth by Sertuerner, that the morphine exists in actuality in the opium in the state of a meconate. Therefore, in the present state of things, and until one has positively demonstrated the contrary, I find myself authorized by the preceding facts to consider provisionally the *codeate of morphine* as a true *muriate*.<sup>92</sup>

<sup>90</sup> Ure (1831), p. 710 (GB).

<sup>91</sup> Robiquet. "Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*, vol. 12 (1826), pp. 70-71. Originally, *Lorsque l'action fut entièrement terminée, on filtra la liqueur et on la soumit à l'ébullition. Arrivé à ce point, je versai une quantité convenable d'ammoniaque; je retirai du feu et le recueillis, après refroidissement, le précipité qui s'était formé, mais je vis que la proportion en était bien moindre que par la méthode ordinaire ... et j'obtins à peine 4 grammes de morphine.*

<sup>92</sup> Robiquet. "Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*, vol. 12 (1826), pp. 71, 73. Originally, *Examiné dans son état brut, je le pris d'abord pour un méconate ...*

A report presented to the *Académie Royale de Médecine, Section de Pharmacie* in 1825 analyzed the experiments of Robinet and Robiquet and just what had or had not been obtained (italics added):

We recognized some work of M. Robinet on the analysis of vegetable substances by means of saline solutions and the conclusions which have been drawn. But, in one of the last sessions, Professor M. Robiquet submitted his work to a new examination and this has resulted in some very important facts which prove that the attempted analysis by saline solutions is not at all mechanical, as had been thought. It offers on the contrary some examples of *double decomposition or exchange of bases* .... M. Robiquet, repeating the analysis of opium with saline solutions obtained first a black, sticky precipitate. The swimming fluid was filtered, brought to a boil and ammonia was added. Very little morphine was precipitated. The liquor left to rest, still alkaline, let deposit a grainy precipitate which, purified and examined, was recognized as a *muriate of morphine*. *The hydrochloric acid could only have been furnished by the sea salt*. From this there arise some doubts about the codeate of morphine announced by M. Robinet. Repeated trials were convincing that in fact the salt obtained which presented absolutely the characters of the salt of M. Robinet were only a true *hydrochlorate of morphine*, very recognizable by the vapors which were given off with concentrated sulfuric acid and by the insoluble precipitate which it gave with nitrate of silver. M. Robiquet thus raises some well founded doubts about the existence of a codeic acid and a codeate of morphine in opium; he also thinks that the meconate of soda announced by M. Robinet resulted from an *exchange of bases*, which happens frequently in complex combinations. ...

---

*mais ce ne fut qu'après la complète purification que je pus constater sa véritable nature et reconnaître que c'était un muriate de morphine. Il me fut impossible de me rendre compte de ce résultat sans admettre que l'acide hydrochlorique avait été fourni par le sel marin ... d'où il faudrait inférer, contre l'avis de M. Robinet, contre ma propre opinion, mais conformément à l'idée primitivement émise par Sertuerner, que la morphine existe bien réellement dans l'opium à l'état de méconate. Ainsi, dans l'état actuel de choses, et jusqu'à ce qu'on nous ait positivement démontré le contraire, je me trouve autorisé par les faits précédents à regarder provisoirement le codéate de morphine comme un véritable muriate.* Italics Robiquet for codeate of morphine and muriate (*codéate de morphine* and *muriate*).

Our colleague Pelletier has also recognized a *muriate of morphine* in the supposed codeate.<sup>93</sup>

The same article was translated in the *EJMS* (italics added) :

We have noticed the labours of M. Robinet on the analysis of vegetable bodies by means of saline solutions, and the results to which it conducted. But, in one of the late sittings, Professor Robiquet repeated his investigations, and has obtained some very important results, which prove that the analysis by the saline solutions is not mechanical as was supposed; but, on the contrary, affords *an example of double decomposition or exchange of bases*. According to M. Robiquet, the organic alkalis are not united to acids in vegetables, but to particular substances which act the same part, as the colouring matters, &c. The vegetable acids are combined with the earthy or fixed alkaline bases of the plants. M. Robiquet, repeating the analysis of opium by means of saline

---

<sup>93</sup> "Analyse des travaux du troisième trimestre de 1825," *Journal de Pharmacie et des Sciences Accessoires*. Vol. 11. Paris: Chez Louis Fils, 1825, pp. 471-472 (GB). Originally, *Nous avons donné connaissance des travaux de M. Robinet sur l'analyse des substances végétales au moyen des solutions salines, et des résultats auxquels il est parvenu. Mais, dans l'une des dernières séances, M. le professeur Robiquet a soumis ses travaux à de nouvelles recherches, et il en est résulté des faits très-importans, qui prouvent que l'analyse tentée par les solutions salines n'est point mécanique, ainsi qu'on le pensait: elle offre au contraire des exemples de doubles décompositions ou d'échanges de bases. ... M. Robiquet, répétant l'analyse de l'opium au moyen des solutions salines, obtint d'abord un précipité poisseux. La liqueur surnageante, filtrée, soumise à l'ébullition, l'on y versa de l'ammonique. Il y eut fort peu de précipité de morphine. La liqueur restante, encore alcaline, laissa déposer un précipité grenu qui, purifié et examiné, fut reconnu pour du muriate de morphine. L'acide hydrochlorique n'avait pu être fourni que par le sel marin. Dès lors il naquit des doutes sur le codéate de morphine annoncé par M. Robinet. Des essais répétés convinquirent en effet que le sel obtenu qui présentait absolument les caractères du sel de M. Robinet n'était qu'un vrai hydrochlorate de morphine très-reconnaissable par les vapeurs qu'il exhale avec l'acide sulfurique concentré; et par le précipité insoluble qu'il donne par le nitrate d'argent. M. Robiquet élève donc des doutes bien fondés sur l'existence d'un acide codéique et d'un codéate de morphine dans l'opium: il pense également que le méconate de soude annoncé par M. Robinet résulte d'un échange de bases, ce qui arrive fréquemment dans les combinaisons complexes. ... Notre confrère Pelletier avait aussi reconnu un muriate de morphine dans le prétendu codéate ....*



solutions, obtained at first a pitchy precipitate. The supernatant fluid filtered, submitted to ebullition, and, mixed with ammonia, threw down a very small precipitate of morphia. The fluid left at rest, being still alkaline, deposited a granular precipitate, which, on being purified and examined, was recognised as muriate of morphia. *The hydrochloric acid had been furnished by the sea salt.* This fact raised doubts respecting the codiate of morphia, announced by M. Robinet; and repeated experiments proved that the salt obtained, which presented absolutely the characters of the salt of M. Robinet, was a true *hydrochlorate of morphia*, very easily detected by the vapours which it exhales, when treated with concentrated sulphuric acid, and the insoluble precipitate, which it gives with nitrate of silver. M. Robiquet thence raises well founded doubts as to the existence of codiac acid, and the codiate of morphia in opium; and M. Robiquet thinks also that the meconate of soda announced by M. Robinet results from an *exchange of bases*, which frequently happens in complex combinations. M. Pelletier, since the publication of his report on the essay of M. Robinet, has also recognised a *muriate of morphia* in the pretended codiate.<sup>94</sup>

Henry (1831) recorded the debate:

This salt Robiquet considers as compounded of morphia, and an acid .... For this acid Pelletier has proposed the name of *codeic acid*, from the head of the poppy. Instead of morphia, Chasseur suggested the name of *narceine*, which Robiquet prefers, and the compound of the two (codeate of morphia) he expresses by the term of *sedative salt of Robinet*. It is proper, however, to observe that Robiquet considers the supposed codeate as a true muriate of morphia (*Ann. de Ch. et de Ph.* xxxi. 73).<sup>95</sup>

In the end, Robiquet disagreed with the theoretical explanation of the precipitate that Robinet obtained, showing that Robinet's new sedative salt was in fact morphine hydrochloride.<sup>96</sup>

<sup>94</sup> "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, pp. 202-203 (GB).

<sup>95</sup> Henry (1831), p. 258 (GB).

<sup>96</sup> Hodge, Hugh L., M. D. *North American Medical and Surgical Journal*. Vol. II. Philadelphia, PA: J. Dobson, 1826, p. 208 (GB).

#### D. DISCUSSION

To try to settle the debate over the preexistence of the alkalinity of Sertuerner's new crystalline base, Robinet experimented with opium dissolved in a concentrated saline solution. Bridgman noticed the salt and lime being spread "profusely" in tank two. Lin writes to the emperor that he uses not simply salt but a salt brine.

Robinet thought of his salt solutions as neutral solvents separating the elements of opium mechanically, much like water. In the process of trying to understand these results, Robinet, Henry, Robiquet, Kane, Gregory, Pelletier and Guibourt repeatedly experimented with concentrated salt solutions. All observed the same separation of the opium as does Lin in his letter to the emperor describing his method of dissolving opium in a salt brine. The observation is so similar and will be repeated later by other chemists that one could be forgiven for suspecting a conduit of knowledge from these European chemists to the Chinese melters with their opium furnaces or vice versa.

These experiments with salt solutions and opium hoped to demonstrate the preexistence of the base in the plant but instead led to a broader understanding of the way even so-called neutral salts could extract and isolate morphine. Such techniques would later be extended to the extraction of other alkaloids from medicinal plants. Robinet also experimented with acidified lime precipitations of morphine from opium, specifically using carbon dioxide to precipitate the lime still holding morphine in solution.

Pelletier and Guibourt verified the experiments of Robinet as to the sedative salt that he had obtained. At first they were convinced by his results but they found unexpected chlorides in the result. English reviewers discovered the same. Orfila and Olivier tested the newly derived salt on dogs. Pelletier also experimented with lime precipitations from solutions of opium.

In his analysis of the work of Robinet, Robiquet soaked opium in a salt solution and then added an alkali, ammonia. The cooled solution provided him with a result that he recognized as morphine hydrochloride. He reasoned that the chloride must have come from the neutral salt. Thus, the separation by saline solutions was not mechanical but was another example of exchange of bases or double decomposition. In other experiments, he separated the morphine from its acid with magnesia, another alkaline metal earth. Tilloy substituted for the magnesia, lime. Commissioner Lin writes the emperor that he soaks opium in a salt solution and adds an alkaline metal earth, "whole pieces of thoroughly heated limes." Robinet, Robiquet, Tilloy, and Pelletier all obtained morphine after treating solutions of opium with either salt or lime.

XVII  
CLASSIC METHODS  
AND COMMERCIAL PRODUCTION

---

- XVII. CLASSIC METHODS AND COMMERCIAL PRODUCTION
- A. CLASSIC METHODS
    1. LIME, SODIUM CARBONATE, SAL AMMONIAC AND MERCK
    2. LIME, AMMONIUM CHLORIDE AND PELLETIER, THIBOUMÉRY AND MOHR
    3. CALCIUM CHLORIDE AND GREGORY AND ROBERTSON
  - B. COMMERCIAL PRODUCTION
  - C. DISCUSSION

*I*N the 1820s and 1830s other chemists and pharmacists followed the lead of Sertuerner and began to experiment with extracting and isolating the morphine and other alkaloids from opium. They tried many different substances, including magnesia and sodium carbonate. In these two decades, all three of the so-called classic methods for extracting morphine from opium were described. This period also sees the first commercial production of morphine. For both economic and theoretical reasons, salt and lime became part of this process.

## A. CLASSIC METHODS

## 1. LIME, SODIUM CARBONATE, SAL AMMONIAC AND MERCK

Heinrich Emmanuel Merck (1794-1855) "took over his father's long-established Darmstadt pharmacy in 1816 after studying with Trommsdorff at Erfurt."<sup>1</sup> H. E. Merck "first became interested in alkaloid chemistry when he was a student. At the time, techniques for isolating and purifying medically useful chemicals from plants were less than ten years old."<sup>2</sup> He collaborated with Justus Van Liebig, "one of the founding fathers of organic chemistry."<sup>3</sup>

Liebig recalls one of their first methods for producing morphine:

Also we produced morphine, this special alkaloid from opium which may be an essential part of the *Aqua Tofana*.<sup>4</sup> We ground one ounce of opium with concentrated acetic acid until the mixture was uniform, filtered the acetate of morphine, added ammonium, whereby it did precipitate. The filtered liquid contained meconic acid, which was precipitated with acetate of barium ....<sup>5</sup>

In 1831 Liebig also investigated the chloride salts of the alkaloids morphine, strychnine, quinine and cinchonine and "deduced that their power of neutralizing acids was directly proportional to their nitrogen content."<sup>6</sup>

---

<sup>1</sup> Brock, William H. Justus Van Liebig: The Chemical Gatekeeper. Cambridge, UK: Cambridge University Press, 1997, p. 6 (GB).

<sup>2</sup> Karch, Stephen B. A Brief History of Cocaine: From Inca Monarchs to Cali Cartels. 2nd edition. Boca Raton, FL: CRC Press, 2006, p. 102 (GB).

<sup>3</sup> Brock, p. 14 (GB).

<sup>4</sup> Aqua Tofana, a mixture of arsenic, lead, belladonna, and possibly opium was made and widely sold by Giulia Tofana of Palermo, Sicily and is said to have been responsible for some 600 deaths, "mostly husbands of unhappy spouses." From wikipedia; [www.fromoldbooks.org](http://www.fromoldbooks.org); and, <http://onlinedictionary.datasegment.com>; and [www.webster-dictionary.net](http://www.webster-dictionary.net).

<sup>5</sup> Brock, p. 14 (GB).

<sup>6</sup> Brock, p. 77 (GB).

Robert Kane's Elements of Chemistry (1842) gives a different version of the Merck process, often attributed to Pelletier, Thibouméry and Mohr (*italics added*):

The process of Merck is founded on the insolubility of morphia in a solution of sal ammoniac, and its solubility in *lime* water. Opium is to be digested in three times its weight of water, then expressed, and then repeated three or four times; these solutions being mixed are brought to a boil, and milk of *lime* added in slight excess, the precipitate which forms is to be collected on a strainer and strongly pressed: the liquor is then to be evaporated, until it is about twice the weight of the opium employed, and to be then filtered, brought to boil, and for each pound of opium, one ounce of *sal ammoniac* added in powder. The morphia separates in crystals, and may be purified by boiling with some *lime* and ivory black, and precipitation again by sal ammoniac.<sup>7</sup>

Sal ammoniac was an early designation for ammonium chloride. Kane, more than likely, had tried this himself since he notes in the preface:

The processes given, for the preparation of the various substances described, are, with very few exceptions, those followed either in my private laboratory, or in the manufacturing laboratory of the Apothecaries' Hall of Ireland.<sup>8</sup>

The result of his experiment using the Merck process?

Morphia crystallizes in right rhombic prisms ... its taste is strongly and permanently bitter; it is almost insoluble in water, requiring four hundred parts when boiling and separating almost completely as the liquor cools. The solution reacts strongly alkaline; it dissolves readily in alcohol, but very sparingly in ether. It dissolves in solutions of caustic alkalis or earths. ... Morphia completely neutralizes the strongest acids, forming salts, which are generally soluble and crystallizable.<sup>9</sup>

---

<sup>7</sup> Kane, Robert. Elements of Chemistry. Dublin: Hodges and Smith, 1842, p. 1061 (GB). Though attributed to Merck, this recipe shares much with the method of Pelletier-Thibouméry-Mohr.

<sup>8</sup> Kane (1842), p. viii (GB).

<sup>9</sup> Kane (1842), pp. 1061-1062 (GB).

Kane also suggests that the Merck process has been supplanted by another using muriatic acid, common salt and ammonia (*italics added*):

To obtain pure morphia, the process invented by Wittstock, is perhaps the best. One part of opium, eight of water, and two of *muriatic acid*, are to be digested together for six hours; when the mixture has cooled, the brown solution is to be poured off, and the residue treated twice more with water and acid. The liquors so obtained being mixed, are to be saturated with *common salt*, on which they become milky, and after a few hours, a brown clotty precipitate forms; this being removed by the filter, *ammonia* is to be added in slight excess, and the whole allowed to stand for twenty-four hours. The precipitate which forms is this time to be collected on a filter, washed with a little water, dried, and digested in spirit of specific gravity 0.820, which dissolves out the morphia. By distillation, the greater part of the spirit is removed, and the morphia being dissolved in a small quantity of boiling alcohol, crystallizes on cooling. In this process, the narcotin is separated by the addition of the *common salt*, in a solution of which it is insoluble; the meconic acid, codein and thebain remain dissolved after the addition of the ammonia in excess, and the other principles present in the opium remain in the mother liquor after the morphia crystallizes.<sup>10</sup>

A similar version, also attributed to Wittstock shows up in the *Traité de Chimie Générale* (*italics added*):

The morphine can also be extracted with the following method: The opium is digested with eight parts of water to two parts of pure hydrochloric acid. At the end of six hours, the extract is decanted and four parts of *sodium chloride* is dissolved in it; the narcotine is precipitated, while the morphine remains in solution. The liquor is decanted, it is then mixed with an excess of *ammonia*, and, after having been heated slightly, it is abandoned to rest for twenty-four hours. The new precipitate which is formed is captured by the filter, washed with a small quantity of water and submitted to dessiccation. Alcohol at 82 percent is added, which leaves in an insoluble state various salts, including the malates, meconates, phosphates and some colored substances. The alcoholic liquor, submitted to evaporation, leaves as a residue the morphine nearly colorless, but still containing a small quantity of narcotine. This residue is dissolved with hydrochloric acid and the liquor is evaporated until

---

<sup>10</sup> Kane (1842), pp. 1060-1061 (GB).

crystallization. A saline mass is deposited which is pressed between two filter papers. The narcotine, which crystallizes in the chlorhydrate with difficulty, remains in the mother liquor. One purifies the *chlorhydrate of morphine* by making it crystallize and then one decomposes it with *ammonia*. (Wittstock.)<sup>11</sup>

The Wittstock process is still being reported in English, but only briefly, by Ure in 1854:

Morphia is prepared as follows: Opium in powder is to be repeatedly digested with dilute muriatic acid, slightly heated, and *sea-salt* is to be added, to precipitate the *opian*. The filtered liquid is to be super-saturated with ammonia, which throws down the morphia.<sup>12</sup>

Muriatic acid is of course an early designation for hydrochloric acid. These versions of the Wittstock process share some similarities with

---

<sup>11</sup> Pelouze, J. and Fremy, E. *Traité de Chimie Générale*. Second edition. Volume four. Paris: Librairie de Victor Masson, 1855, pp. 390-391 (GB). Originally, *La morphine s'extrait encore de l'opium par la méthode suivante: L'opium est mis en digestion avec 8 parties d'eau additionnées de 2 parties d'acide chlorhydrique pur. Au bout de six heures, on décante l'extrait acide et l'on y dissout 4 parties de chlorure de sodium; la narcotine se précipite, tandis que la morphine reste en dissolution. La liqueur est décantée, on la mélange ensuite avec un excès d'ammoniaque, et, après l'avoir chauffée légèrement, on l'abandonne au repos pendant vingt-quatre heures. Le nouveau précipité qui se forme est jeté sur un filtre, lavé avec une petite quantité d'eau et soumis à la dessiccation. On l'épuise par l'alcool à 0,82 cent., qui laisse à l'état insoluble différents sels, tels que des malates, des méconates, des phosphates et des substances colorantes. La liqueur alcoolique, soumise à l'évaporation, laisse pour résidu de la morphine à peu près incolore, mais contenant encore une petite quantité de narcotine. On dissout ce résidu dans l'acide chlorhydrique et l'on évapore la liqueur jusqu'à cristallisation. Il se dépose une masse saline que l'on comprime entre des doubles de papier à filtrer. La narcotine, dont le chlorhydrate cristallise difficilement, reste dans les eaux mères. On purifie le chlorhydrate de morphine en le faisant cristalliser, puis on le décompose par l'ammoniaque.* (Wittstock.)

<sup>12</sup> Ure, Andrew. *A Dictionary of Arts, Manufactures and Mines Containing a Clear Exposition of Their Principles*. New York, NY: D. Appleton, 1854, p. 241 (GB).



that previously employed by Robiquet who also used common salt to separate the opium and ammonia to precipitate the morphine.

Barbier (1950) says Merck also used sodium carbonate to obtain morphine. This method which dates from 1830, he calls one of the "three classical processes for the extraction of morphine ... all very old" (*italics added*):<sup>13</sup>

The opium is exhausted with cold water and the resultant liquor concentrated to a syrupy consistency. It is then precipitated hot with powdered *sodium carbonate* and heated as long as ammonia is given off; the solution should remain alkaline to phenolphthalein. After standing for twenty-four hours, the resultant precipitate is filtered and washed with cold water; when the wash water is colourless, the precipitate is dissolved in alcohol at 85°. The alcoholic solution is evaporated, to dryness and the residue is exhausted by means of dilute acetic acid, which is added in small quantities as neutralization proceeds. The acetic acid solution is treated with decolorizing charcoal, then filtered and precipitated with ammonia, care being taken to avoid an excess. The precipitate is filtered, washed, and purified by crystallization from alcohol; concentration of the alcoholic mother-liquor yields a further quantity of morphine.<sup>14</sup>

Roughly the same story of the Merck recipe can be found in the 1855 *Traité de Chimie Générale* (*italics added*):

In order to extract the morphine from opium, one can soak the opium in cold water, evaporate the liquor to the consistency of syrup, and, while it is still hot, add some *sodium carbonate* until all the outgassing of the ammonia has ceased. The precipitate which is formed is, at the end of twenty-four hours, captured on a filter and washed in cold water. When the wash waters show no color, dilute acetic acid is added. It is necessary, during the latter operation, to use at first only a small quantity of the (acetic) acid, and to wait, before adding any more, until the previous portion should be perfectly saturated. It is filtered; it is decolorized with animal black and ammonia is added which produces an abundant precipitate. After having washed this precipitate, it is

---

<sup>13</sup> Barbier (1950), p. 1.

<sup>14</sup> Barbier (1950), p. 1.

dissolved warm in alcohol which deposits upon cooling some beautiful crystals of pure morphine. (M. Merck.)<sup>15</sup>

Barbier adds his own opinion of this method:

I have not tried this process, which is not mentioned by any modern author. The method of purifying the morphine does not appear to be a good one, and the considerable quantities of alcohol required, owing to the slight solubility of morphine in this solvent, made it impossible to consider it for industrial use.<sup>16</sup>

## 2. LIME, AMMONIUM CHLORIDE AND PELLETIER, THIBOUMÉRY AND MOHR

With Mohr and Thibouméry, the director of his chemical products factory,<sup>17</sup> Pelletier described in the 1830s the second of what Barbier (1950) calls the three classical methods of extracting alkaloids from opium, this one using *lime* and a salt, ammonium chloride (*italics added*):

The opium is cut into thin slices and treated with three times its weight of hot water until a homogeneous paste is obtained. The liquid is filtered off, the residue pressed and again treated with three times its weight of water. The

---

<sup>15</sup> Pelouze, J. and Fremy, E. *Traité de Chimie Générale*. Second edition. Volume four. Paris: Librairie de Victor Masson, 1855, p. 390 (GB). Originally, *Pour extraire la morphine de l'opium, on peut épuiser l'opium par l'eau froide, évaporer la liqueur à consistance sirupeuse, et, pendant qu'elle est chaude, y ajouter du carbonate de soude jusqu'à ce que tout dégagement d'ammoniaque ait cessé. Le précipité qui se forme est, au bout de vingt-quatre heures, jeté sur un filtre et lavé à l'eau froide. Lorsque les eaux de lavage passent incolores, on l'épuise par l'acide acétique étendu. Il faut, dans cette dernière opération, n'employer à la fois qu'une petite quantité d'acide, et attendre, pour en ajouter de nouveau, que la portion dont on se sert soit parfaitement saturée. On filtre; on décolore la liqueur par le noir animal et l'on y verse de l'ammoniaque qui produit un précipité abondant. Après avoir lavé ce précipité, on le dissout à chaud dans l'alcool qui dépose par le refroidissement de beaux cristaux de morphine pure. (M. Merck.)*

<sup>16</sup> Barbier (1950), pp. 1-2.

<sup>17</sup> "Revue médicale française," *Annales de Chimie et de Physique*, vol. 59. Paris: Chez Crochard, 1835, p. 153 (GB).

solutions obtained are evaporated to half their volume and poured into boiling *milk of lime*: one part of *lime* in ten parts of water should be used for four parts of opium. The precipitate is filtered off and re-treated with three parts of water to one part of opium: it is then filtered off again. The *lime solutions* are united and concentrated to a quantity twice the weight of the opium used. The solution is filtered, heated to boiling, and the morphine is precipitated by the addition of *ammonium chloride*. After cooling, it is filtered: the precipitate is washed, then purified by solution in hydrochloric acid and crystallization of the morphine hydrochloride.<sup>18</sup>

As noted, this version was also attributed to Merck. A similar recipe attributed to Mohr shows up in a chemistry text from 1842 (italics added):

Morphine may be prepared without reference to the other bases in opium, by various processes, of which the following appears to be the best. The opium is mascerated thrice in succession, each time with three parts of cold water, and the mass after each digestion strongly expressed. The liquids are united, raised to the boiling point, and mixed with an equal bulk of *milk of lime*, the latter containing a quantity of *hydrate of lime* equal to about one-fourth of the weight of the dry opium employed. After boiling for a few minutes the mixture is strained through linen; all the narcotine, meconic acid, &c., remain in the lime precipitate, while all the morphine is contained in the solution in combination with the *lime*. The solution is greatly concentrated by evaporation, then filtered, heated to the boiling point and pounded *sal ammoniac* is thrown into it, in about the the proportion of one ounce of sal ammoniac to one pound of opium. *The caustic lime is thus converted into chloride of calcium*, the morphine loses its solvent, and is precipitated in small crystalline needles. Opium yields upon an average a sixteenth of its weight of morphine.<sup>19</sup>

The DEA's Southeast Asian chemists are still using a version of this process in the 21st century.

Another variation attributed to Thibouméry uses hydrate of lime and hydrochloric acid:

---

<sup>18</sup> Barbier (1950), p. 2.

<sup>19</sup> Graham, Thomas. Elements of Chemistry. Part 3 - Organic Chemistry. London: Hippolyte Bailliere, 1842, p. 977 (GB).

Other processes have been proposed, as that of M. Thibouméry, which consists in adding hydrate of lime in excess to an infusion of opium, by which the meconic acid is rendered insoluble, while the morphine is taken up with ease by the alkaline earth. By *exactly* neutralizing the filtered solution with hydrochloric acid, the morphine is precipitated, but in a somewhat coloured state.<sup>20</sup>

Barbier (1950) modified the Pelletier, Thibouméry and Mohr process slightly, substituting for the ammonium chloride, sodium chloride or common salt (*italics added*):

This process is an attractive one: there are no technical difficulties and the morphine is well separated from the secondary alkaloids: the morphine solutions are relatively clean. I made certain changes in this process: for instance, instead of precipitating the *lime solution* with ammonium chloride, I acidified it slightly with *hydrochloric acid* and salted out the morphine hydrochloride with *common salt*. In this way I obtained almost all the morphine from the *lime solution* in the form of very pure hydrochloride. The morphine remaining in the salted-out liquid was precipitated and returned for purification.<sup>21</sup>

He adds a note (*italics added*):

I found, however, that this process had one important drawback: the yield was definitely bad. I subsequently discovered that I had not been the only one to encounter this difficulty. It is possible that the bad yield is due to an oxidation of the morphine in alkaline solution, but the fact that the *lime* always retains morphine was also a contributory factor.<sup>22</sup>

### 3. CALCIUM CHLORIDE AND GREGORY AND ROBERTSON

William Gregory (1803-1858) is listed in the Oxford Dictionary of National Biography as a "chemist and psychic investigator:"<sup>23</sup>

<sup>20</sup> Fownes, George. Elementary Chemistry, Theoretical and Practical. Philadelphia, PA: Blanchard and Lea, 1855, p. 445 (GB)

<sup>21</sup> Barbier, p. 2.

<sup>22</sup> Barbier, p. 2.

<sup>23</sup> ONDB, [www.oxforddnb.com/view/article/11475?docPos=23224](http://www.oxforddnb.com/view/article/11475?docPos=23224).

In 1831 he devised a procedure for making pure morphine from opium ('Gregory's salt'), as a result of which Edinburgh became an important centre for the commercial preparation and sale of alkaloidal drugs.<sup>24</sup>

He spent a semester with Justus Van Liebig at the University of Giessen in 1835 and helped establish the Royal College of Chemistry in London in 1845.<sup>25</sup>

By 1831 the focus had shifted from simply obtaining the morphine to how to fabricate a medicine with it:

Acetate of morphia, from its ready solubility, appears to afford the best method of exhibiting this substance as a medicine. ... Tincture of opium, it is observed by Serturner, should be prepared with pure alcohol, and kept in a place which is not very cold; for a low temperature causes a precipitation of morphia. The addition of a little acetic acid prevents this inconvenience, without diminishing the efficacy of morphia on the animal digestion.<sup>26</sup>

To this end, Gregory published the third of the so-called three classical methods for producing a medicinal morphine, known as Gregory's salt, in the early 1830s using calcium chloride and ammonia (*italics added*):

The concentrated aqueous extract from the finely powdered opium is treated with strong *calcium chloride* solution, which removes as calcium salts the meconic acid, lactic acid, and sulphuric acid. From the mother-liquor the so-called Gregory-salt, a mixture of the hydrochloride of morphine and codeine, crystallizes ... *Ammonia* precipitates the morphine from a solution of the purified Gregory-salt, while the codeine remains in solution from which it may be separated by extracting with benzene or by concentrating to the point where a mixture of ammonium chloride and codeine hydrochloride crystallizes.<sup>27</sup>

---

<sup>24</sup> [ONDB](http://ONDB.oxforddnb.com/view/article/11475?docPos=23224), [www.oxforddnb.com/view/article/11475?docPos=23224](http://www.oxforddnb.com/view/article/11475?docPos=23224).

<sup>25</sup> [ONDB](http://ONDB.oxforddnb.com/view/article/11475?docPos=23224), [www.oxforddnb.com/view/article/11475?docPos=23224](http://www.oxforddnb.com/view/article/11475?docPos=23224).

<sup>26</sup> Henry (1831), p. 259 (GB).

<sup>27</sup> Small, p. 175.

Sometimes called the Robertson-Gregory process, Barbier (1950) describes it more completely but from the viewpoint of how afterwards to purify the morphine (*italics added*):

The opium is completely exhausted by five to ten times its weight of cold water; the solution obtained is evaporated to the consistency of a soft extract, and then the process is repeated with cold distilled water. This aqueous re-extraction causes impurities to precipitate, they are filtered off and the solution obtained is evaporated until its density is 10° Baumé. One hundred and twenty grammes of *calcium chloride* for each kilogram of opium are added to the boiling liquor which is then diluted with a quantity of cold water equal to its own volume. A precipitate of meconate and sulphate of calcium is thus formed and is filtered off. After filtering, the liquid is again concentrated, and this produces a new deposit which consists almost exclusively of calcium meconate. This deposit is filtered off and the solution is left standing. After a few days it becomes a crystalline mass composed of morphine hydrochloride and codeine hydrochloride: this is known as "Gregory's salt." The crystals obtained are drained and then placed in a cloth and squeezed out in the press. They are purified by successive crystallizations, the solutions being decolorized each time with animal charcoal. When the crystals are sufficiently pure, they are dissolved in water and the morphine is precipitated with *ammonia*; the codeine remains in solution.<sup>28</sup>

Barbier (1950) describes two drawbacks of this method of first obtaining the Gregory salt and then trying to purify it to obtain the morphine:

The first drawback of this process is that 20 to 25 per cent of the morphine is left with the secondary alkaloids in the brown and viscous mother-liquids after filtration of "Gregory's salt." ... The second drawback is that the hydrochloride of morphine and codeine crystallize in furry needles which retain the mother-liquids in which the crystallization occurred. Several successive crystallizations and subsequent recoveries are required for purification, and this is a time-consuming process.<sup>29</sup>

---

<sup>28</sup> Barbier, p. 2.

<sup>29</sup> Barbier, p. 2.

Gregory's original purpose was not so much purification but how to find a more economic process for preparing the muriate of morphia without using alcohol:

As the muriate of morphia promised to be a salt useful in medicine, I endeavoured to find a method by which as large a quantity as possible might be extracted from opium *without the use of alcohol*. ... Opium is cut in small pieces, and completely exhausted by cold water, or water at 90 degrees F. The aqueous solution is concentrated till it occupies a small bulk, and is precipitated by a slight excess of *ammonia*. The precipitate is collected on a filter, washed moderately with cold water, and at a temperature below 212 degrees. When dry, it is reduced to powder, and rubbed up with cold water. Diluted muriatic acid is now added by degrees. ... By a third crystallization the muriate of morphia may be obtained in radiated bunches of silky crystals of snowy whiteness. ... I am presently engaged, along with my friend, Dr. Montgomery Robertson, in endeavouring to purify the muriate with a smaller loss, and with good hopes of the result.<sup>30</sup>

The next year (1832) Montgomery Robertson published his improvement on the Gregory method. His object also was not so much to extract and purify the morphine but to produce a cheap retail medicine that could be substituted for opium:

Some chemists, indeed, as Merck and Wittstock, have, by ingenious and expensive procedures, obtained morphia perfectly pure. But I speak of the alkaloid as it is generally manufactured; when the object of the pharmacist being merely to procure a saleable article, purity is little valued, and not particularly sought after, when it is obtained at the expense of considerable diminution in quantity. ... But by introducing into medicine the muriate of morphia, and publishing a mode of preparing it, Dr. Gregory rendered the latter part of these processes useless, and abridged much that was tedious and objectionable. I have now to propose an improved method: which, by

---

<sup>30</sup> Gregory, William. "On a Process for Preparing Economically the Muriate of Morphia," *The Edinburgh Medical and Surgical Journal*, volume 35. Edinburgh: Adam Black, 1831, pp. 331-333 (GB). Muriatic acid (pertaining to brine or salt) was an early name for hydrochloric acid.

curtailing still further the necessary operations, will render the preparation of the muriate, much more easy and economical.<sup>31</sup>

Instead of precipitating the morphine with ammonia and then being faced with the problem of removing the narcotine with various acids and recrystallizations, his method uses only muriate of lime (calcium chloride,  $\text{CaCl}_2$ ) and some pieces of marble and chalk (predominantly calcium carbonate,  $\text{CaCO}_3$ ), both relatively inexpensive:

This process has for its prominent feature the employment of *double decomposition*: a plan which secures at one step the separation of the meconic acid, and the union of the morphia with muriatic acid. The liquid employed to effect this decomposition is the muriate of lime [calcium chloride]; an article whose cheapness renders economy in its use no object.<sup>32</sup>

He begins very much as the other methods then being used by soaking the opium in a solution of warm water (*italics added*):

The first step of the process resembles that of all others, in so far as the solution of the active principles is concerned. The opium, cut in pieces, is mascerated in water at a temperature not exceeding 100 [degrees] F.; as it softens it is worked up into a pulp, and frequently stirred during the course of exhaustion; the infusion, as it becomes saturated, is drawn off clear, and may be immediately subjected to evaporation. This evaporation is conducted in a large vessel of tinned iron; and a sufficient quantity of *marble*, in coarse powder, is added to saturate the free acid.<sup>33</sup>

He reduces the liquid and is ready to add his muriate of lime (*italics added*):

---

<sup>31</sup> Robertson, Montgomery. "Process for preparing pure Muriate of Morphia," *American Journal of the Medical Sciences*, volume 10. Philadelphia, PA: Carey and Lea, 1832, p. 488 (GB).

<sup>32</sup> Robertson, Montgomery. "Process for preparing pure Muriate of Morphia," *American Journal of the Medical Sciences*, volume 10. Philadelphia, PA: Carey and Lea, 1832, p. 488 (GB). *Italics* Robertson.

<sup>33</sup> Robertson, Montgomery. "Process for preparing pure Muriate of Morphia," *American Journal of the Medical Sciences*, volume 10. Philadelphia, PA: Carey and Lea, 1832, p. 488 (GB).



The *muriate of lime* [calcium chloride] used should contain no iron, lest, in combination with meconic acid, it give a deep colour to the liquid, difficult to be got rid off [sic]; and the quantity required for each portion of infusion, is best learned by experience. When the infusion has reached the consistence of syrup, an excess of *muriate of lime* is poured in, and the boiling is continued for a few minutes longer. Then the whole may be emptied into a large basin, and when cold, diluted with water until a copious separation of resinous flocks takes place. In this way most of the meconate of lime, which is nearly insoluble, and a great quantity of colouring matter, are got rid of.<sup>34</sup>

Then he begins the process of purification:

When these flocculi have subsided, the clear part is evaporated as far as possible, on a sand-bath; a small bit of marble being put into each dish to neutralize any free acid, and the fluid being poured off the sediment before it is permitted to crystallize. ... When about to consolidate, it is stirred into a uniform mass, from which, enclosed when cold in a stout cloth, the dark fluid is expressed as completely as possible.<sup>35</sup>

He then redissolves his "cake of impure muriate" in tepid water, filters it of impurities, adds a bit of muriate of lime, reevaporates, and neutralizes again. In the third evaporation he adds a bit of acid to help remove the color:

In the next evaporation the liquid, now completely free from meconate of lime, is slightly acidulated; a judicious suggestion due to Dr. Gregory, who has observed that the acid renders the colouring matter more soluble, and thus more completely separated, when the product is expressed for the third time. ... This effect produced on the colour by the addition of an acid, (and any acid will do,) I cannot explain. It was first observed by Dr. Gregory, who has also remarked that muriatic acid, added to a neutral solution of muriate of the specific gravity of 1.020, when cold, and in which there is no appearance of crystallization, causes it in a short time to become a mass of crystals, which, when dried to the air, are perfectly neutral.<sup>36</sup>

---

<sup>34</sup> Robertson (1832), p. 488 (GB).

<sup>35</sup> Robertson (1832), p. 489 (GB).

<sup>36</sup> Robertson (1832), p. 489 (GB).

His light brown cake of muriate of morphia is redissolved in boiling water, neutralized with chalk, mixed with charcoal, filtered and dried. The result "resembles chalk in colour and appearance, is permanent in the air, and is fit for medical use." He obtained eleven and one-half per cent muriate of morphia from 56 pounds of "good opium" and "12 per cent. is, in my opinion, the utmost that can be expected from ordinary opium .... The cost of manufacture, including the price of the opium, &c., amounted to 17s.6d. the ounce troy. This then may be reckoned a fair trial of its success on a large scale."<sup>37</sup>

A decade later, Kane (1842) is giving this recipe for a medicinal grade of muriate of morphia in his chemistry text (*italics added*):

[Muriate of morphia is], for medicinal objects, the most important compound of morphia: its preparation, as directed by the British pharmacopeias, is as follows: The soluble parts of opium having been dissolved out by digestion in water, the united liquors are to be evaporated to the consistence of a sirup, and then cold water added, by which a quantity of feculent matter (apotheme) is separated; the clear liquor is to be decomposed by a slight excess of chloride of lead (London), or of *chloride of calcium* (Edinburgh). The meconate of morphia, which exists in the opium, being decomposed, meconate of *lime* or lead is precipitated, and muriate of morphia remains dissolved; the liquor is to be carefully strained and evaporated to a pellicle; on cooling, the salt crystallizes; this is to be pressed between folds of cloth, to remove the dark mother liquor, and then dissolved in boiling water, digested with ivory black, and recrystallized until the crystals become permanently white. The product of this method, although not chemically pure, is sufficiently so for medicinal uses. It contains codeine, and sometimes others of the opium alkaloids. To obtain the pure salt, pure morphia should be dissolved in dilute muriatic acid, and the salt crystallized.<sup>38</sup>

In 1856 Gregory's Handbook still gives roughly the same recipe (*italics added*):

The alkaloids occur in combination, generally with vegetable acids; and they are separated from these combinations by the same means which are employed in the case of inorganic bases, modified in each case, according as

<sup>37</sup> Robertson (1832), pp. 489-490 (GB).

<sup>38</sup> Kane (1842), p. 1062 (GB).

the alkaloid is soluble or insoluble in water and other solvents, fixed or volatile when heated. Thus quinine, morphine, and strychnine are separated by adding to their soluble salts, *lime*, ammonia or magnesia, which form soluble salts with the acids which are present, while the alkaloids, being insoluble, are precipitated. ... Morphine. ... Perhaps the easiest method of extracting it is the following. The soluble part of opium is extracted by water, and the concentrated infusion is mixed with solution of *chloride of calcium*, this salt being added in slight excess. On standing, especially if warmed, the mixture deposits a copious brownish-grey precipitate of mixed meconate and sulphate of *lime* (the morphine being in the opium partly as meconate, partly as sulphate), while hydrochloride of morphine remains in solution with a very large proportion of dark brown colouring matter. The brown solution is evaporated till, on cooling the hydrochlorate crystallises, forming a nearly solid mass, which is subjected to very strong pressure with flannel. A thick, viscid, nearly black mother-liquor is thus expressed, which contains all the narcotine and colouring matter.<sup>39</sup>

The result is redissolved in hot water, filtered, recrystallized, and purified using animal charcoal.

The same process is recorded in other elementary chemistry texts from mid-19th century, attributed to Gregory:

Morphine and its salts are advantageously prepared, on the large scale, by the process of Dr. Gregory. A strong infusion of opium is mixed with a solution of chloride of calcium, free from iron: meconate of lime, which is nearly insoluble, separates, while the hydrochloric acid is transferred to the alkaloids. By duly concentrating the filtered solution, the hydrochlorate of morphine may be made to crystallize, while the narcotine, and other bodies, are left behind.<sup>40</sup>

An expanded description of the same process shows up in George Wilson's Chemistry (1860):

Morphia or Morphine. Morphia occurs in opium ... in combination with a peculiar vegetable acid, called from the Greek name for the poppy, the *meconic*. To obtain morphia, opium is cut in small pieces, and boiled in a glass

---

<sup>39</sup> Gregory, William. A Handbook of Organic Chemistry. 4th edition. London: Waltan and Maberly, 1856, pp. 410, 418 (GB).

<sup>40</sup> Fownes, George. Elementary Chemistry, Theoretical and Practical. Philadelphia, PA: Blanchard and Lea, 1855, p. 445 (GB).

or porcelain vessel with water, till a dark-brown solution is procured. This contains, besides many other compounds, the morphia and meconic acid combined together as meconate of morphia. A solution of chloride of calcium is added to the infusion of opium, which is left at rest till it has ceased to deposit a copious precipitate. This consists of the meconic acid in union with the lime (meconate of lime), whilst hydrochlorate of morphia remains in solution. The liquid is filtered, concentrated by evaporation, and left at rest. The hydrochlorate of morphia separates as a crystalline mass, which is strongly compressed between folds of flannel or filtering paper to get rid of colouring matter and other impurities. The squeezed mass is then dissolved in hot water, and crystallized from it again; and this process is repeated, with the assistance, the last time, of a little animal charcoal, till the salt of morphia is obtained in colourless crystals. The pure hydrochlorate is then dissolved in hot water, and ammonia added to supersaturation. As the liquid cools, the morphia separates as a snow-white crystalline powder, which may be obtained in regular crystals from its solution in boiling alcohol.<sup>41</sup>

## B. COMMERCIAL PRODUCTION

More than a decade before Lin did his grand chemistry experiment in Canton, the science of alkaloid extraction was far enough advanced in Europe to begin commercial manufacture of the newly isolated bases. "Commercial manufacture of morphine began in the 1820s in Britain and in the 1830s in the US; in 1836 morphine appeared in the London Pharmacopeia."<sup>42</sup>

Not simply morphine was being commercially produced. The same period also sees the first manufacture by several pharmaceutical firms of a number of "relatively pure alkaloids and their salts. T.N.R. Morson was the first to make them (in Britain) ... having learnt the processes whilst gaining further experience in Paris."<sup>43</sup> His "Price List of New Chemical Preparations, employed as

---

<sup>41</sup> Wilson, George. Chemistry. London: William and Robert Chambers, 1860, pp. 290-291 (GB).

<sup>42</sup> Hodgson, Barbara. In the Arms of Morpheus. Buffalo, NY: Firefly Books, 2001, p. 80.

<sup>43</sup> Lesley, et al., editors. The Pharmaceutical Industry: A Guide to Historical Records. Aldershot, England: Ashgate Publishing, 2003, p. 10 (GB).

Medicines"<sup>44</sup> of 1821 "shows him to be manufacturing quinine sulphate, morphine acetate as well as emetine, strychnine and brucine amongst other preparations."<sup>45</sup>

Thomas Newborn Robert Morson (1800-1874) "served his apprenticeship with an apothecary in the Fleet Market before studying alkaloid chemistry in Paris."<sup>46</sup> When he returned to London in 1821, he

established himself as a retail pharmacist in Southhampton Row, Bloomsbury, and soon acquired a leading position in the import and supply of quinine and morphia. By 1837 demand for his range of products - which included perfumes and dyes as well as pharmaceuticals and their ingredients - was growing, and, like other pharmacists, he found that the back of the shop was inadequate for manufacturing; he set up a separate factory in Hornsey Road.<sup>47</sup>

Morson soon had plenty of competitors. Besides the larger London dealers like the Diceys, the Newberys, the Wrays, Jacksons, the Barclay family, and Shaw and Edwards, "J. F. Macfarlan and T. H. Smith, both of Edinburgh ... began manufacturing morphine hydrochloride and other opium alkaloids in their backshops and basements in the 1830s."<sup>48</sup> To be more specific, in 1832, Macfarlan Smith Ltd. "began to manufacture morphine acetate and hydrochloride, using the method of isolating morphine from opium, devised by Dr. William Gregory of Edinburgh University."<sup>49</sup>

One thing was to manufacture and quite another was sales:

the ready acceptance of quinine was quite different from that of morphine. Morphine had a competitor in laudanum; less expensive and less dramatic in its effects, it (laudanum) was so well established that the advantages of precise dosage and purity (of morphine) were outweighed. ... Opium has a long history, and medicines made from it were usually reliable and not

---

<sup>44</sup> Morson, p. 83 (GB).

<sup>45</sup> Lesley, p. 10 (GB).

<sup>46</sup> According to the Oxford Dictionary of National Biography, [www.oxforddnb.com](http://www.oxforddnb.com).

<sup>47</sup> ODNB, [www.oxforddnb.com](http://www.oxforddnb.com).

<sup>48</sup> Lesley, p. 11 (GB).

<sup>49</sup> Lesley, p. 283 (GB).

unpleasant to take, whereas bark was unreliable, unpalatable and undigestible. Quinine was accepted as a replacement for bark whereas morphine was (simply) an alternative to opium.<sup>50</sup>

Opium was for a half century a serious competitor for the newly isolated morphine:

Opium, not its alkaloids, was the essential ingredient in the innumerable remedies dispensed in Europe and America for the treatment of diarrhea, dysentery, asthma, rheumatism, diabetes, malaria, cholera, fevers, bronchitis, insomnia, and pains of any sort ... it was impossible to practice medicine without it. ... (U)ntil the development of the hypodermic needle, these alkaloids (morphine, codeine) were not much used. Instead physicians prescribed opium in water - or more usually, opium in alcohol.<sup>51</sup>

A common opinion from the 19th century was that "morphine shows no sign of displacing it (opium) in favor" while the popular Dover's powder (containing opium) was "hardly to be surpassed."<sup>52</sup>

Morson's business continued to expand and he devoted part of his time to professional societies:

In 1869 the factory was moved further out of London, to the Summerfields works, Ponder's End, in Middlesex. ... Morson was a founding member of the Chemical and Pharmaceutical societies; he was a member of the Pharmaceutical Society's council, serving as vice-president and president.<sup>53</sup>

His son Thomas Morson (1825-1908) took over the business after his father's death in 1874. The Morson firm was later acquired by Merck, Sharp and Dohme.<sup>54</sup>

The pharmaceutical company Merck, of course, is the world's oldest and one of the world's largest. It was founded in 1668 in

---

<sup>50</sup> Morson, p. 83 (GB).

<sup>51</sup> Fay, p. 6.

<sup>52</sup> Bynum, W. F. and Porter, Ray, editors. Companion Encyclopedia of the History of Medicine, vol. 2. London: Routledge, 1993, p. 135.

<sup>53</sup> ONDB, [www.oxforddnb.com](http://www.oxforddnb.com).

<sup>54</sup> ONDB, [www.oxforddnb.com](http://www.oxforddnb.com).

Darmstadt, Germany by Frederich Jakob Merck, an apothecary.<sup>55</sup> In 1827 H. E. Merck, to whom is attributed one of the three classic methods for obtaining morphine from opium, transformed the pharmacy into "a factory designed for the mass production of pharmaceuticals."<sup>56</sup> Some of the first products made at the new factory were morphine, codeine, quinine and cocaine.<sup>57</sup>

### C. DISCUSSION

Of the three so-called classic methods for obtaining morphine from opium, all use some compound of calcium and some kind of salt. Merck is described as using methods with both milk of lime and sodium carbonate. Wittstock's modification uses common salt. The second of the classical processes for obtaining morphine from opium proposed by Pelletier, Thibouméry and Mohr uses lime and ammonium chloride and appears to still be in use almost two centuries later according to the DEA. Barbier modified the process using hydrochloric acid and common salt. Gregory and Robinson preferred calcium chloride for the production of a commercially viable medicine. Morson, Merck and many others began commercial production of morphine in Europe in the 1820s and 1830s.

---

<sup>55</sup> Wikipedia; [www.merck.de](http://www.merck.de).

<sup>56</sup> Karch, p. 103 (GB).

<sup>57</sup> Brock, p. 6 (GB); Karch, p. 103 (GB); wikipedia; [www.fundinguniverse.com](http://www.fundinguniverse.com).

## XVIII OTHER ALKALOIDS

---

- XVIII. OTHER ALKALOIDS
- A. OTHER OPIUM ALKALOIDS
    - 1. NARCOTINE
    - 2. CALCIUM CHLORIDE, AMMONIA, POTASH AND CODEINE
    - 3. LIME, AMMONIA AND THEBAINE
    - 4. PAPAVEREINE
  - B. OTHER PLANT ALKALOIDS
    - 1. LIME AND BRUCINE
    - 2. LIME-WATER AND ATROPINE
    - 3. LIME AND CINCHONINE
    - 4. LIME AND QUININE
    - 5. LIME AND SOLANINE
    - 6. LIME AND CAFFEINE
  - C. DISCUSSION AND QUESTIONS

*METHODS* for extracting and isolating morphine from opium were rapidly applied to the analysis of other alkaloids in opium as well as to the separation and isolation of alkaloids from other plants, primarily those already used medicinally. For the purpose of context, it may be useful to examine some of these results.

### A. OTHER OPIUM ALKALOIDS

Opium is a complex mix of water (5-20%), various sugars (20%), as well as fumaric, lactic, oxaloacetic, and meconic (dicarboxylic) acid, the latter at only 3-5 percent.<sup>1</sup> Only some ten to twenty

---

<sup>1</sup> Schiff, p. 6.



percent of opium is composed of alkaloids. More than forty are said to have been isolated but only five account for almost all of the alkaloids in opium: morphine (8.0-17.0%), narcotine, also called noscapine (1.0-10.0%), codeine (0.7-5.0%), thebaine (0.1-2.5%), and papavereine (0.5-1.5%).<sup>2</sup> By 1835, European chemists had isolated four of the five most abundant alkaloids in opium, including Sertuerner's morphine (1817), narcotine (1817) and codeine (1832) both by Pierre Jean Robiquet, and thebaine (1833) by Pelletier and Dumas.<sup>3</sup>

Later in the same century, other alkaloids were also extracted and isolated from the opium obtained from *Papaver somniferum*. Merck isolated papavereine in 1848. Hesse extracted and isolated laudanine in 1870 and laudanoline in 1871, and xanthaline was discovered in 1881.<sup>4</sup> By the end of the century, chemists were combining these newly isolated opium alkaloids with other substances. The semi-synthetic diacetylmorphine (later marketed as "heroin" by the Bayer company) was prepared from morphine by Wright in 1874 and Hesse in 1883 using acetic anhydride, and by Danckwortt in 1890 and Merck in 1899 using acetic chloride.<sup>5</sup>

## 1. NARCOTINE (NOSCAPINE)

This alkaloid was possibly extracted by Derosne in 1803 or 1804 in a mixture contaminated with morphine and meconic acid, though other references cite its first isolation by Robiquet with ether in 1817. Schiff gives its pharmacological action and use:

The alkaloid was found to be devoid of analgesic properties but to possess central antitussive (cough suppressant) activity equal to that of codeine. For that reason, the name of the compound was changed to noscapine. Noscapine possesses bronchodilating actions, but large doses stimulate the release of histamine, with concomitant bronchoconstriction and transient hypotension. Its availability in various cough preparations has lessened, particularly so

---

<sup>2</sup> Schiff, p. 6.

<sup>3</sup> Sonnedecker, p. 361 (GB).

<sup>4</sup> Small, pp. 1, 28, 29, 34.

<sup>5</sup> Small, p. 153.

since it has been reported that the compound may possess teratogenic properties.<sup>6</sup>

Another reference says noscapine has "low toxicity in humans and mice" and may have benefits as an antitumor agent.<sup>7</sup>

## 2. CALCIUM CHLORIDE, AMMONIA, POTASH AND CODEINE

Codeine is found in opium but in such small proportions that its extraction is often not commercially viable. In the 21st century it is usually produced from morphine via methylation.<sup>8</sup> Pharmacologically, codeine acts like morphine but is less potent:

Codeine is used as an analgesic in the relief of mild to moderate pain and in the relief of coughing induced by chemical or mechanical irritation of the respiratory system. The alkaloid is about 60% as effective orally as parenterally, principally because of less first-pass hepatic metabolism.<sup>9</sup>

Kane (1842) supplies a method for extracting codeine and notices that it is simply not used in his era:

This alkali remains dissolved after the morphine, narcotine, and other substances have been precipitated by ammonia. The filtered liquor is to be evaporated to dryness, and digested in solution of potash; a substance remains undissolved which gradually becomes crystalline. This is to be washed with water, and then dissolved in boiling ether, from which, by spontaneous evaporation, the codein [sic] separates in colourless prismatic crystals, which

---

<sup>6</sup> Schiff, p. 15, findarticles.com; teratogenic, meaning "able to disturb the growth and development of an embryo or fetus (www.medterms.com; www.medicinenet.com)."

<sup>7</sup> Keqiang Ye, et al. "Opium Alkaloid Noscapine is an antitumor agent that arrests metaphase and induces apoptosis in dividing cells," *Cell Biology, Pro. Natl. Acad. Sci. USA*, vol. 95, Feb. 1998, pp 1601-1606, found at www.pnas.org.

<sup>8</sup> Schiff, p. 13.

<sup>9</sup> Schiff, p. 13.

contain 2Aq. ... As none of its salts are employed in pharmacy or medicine, they need not be specifically noticed.<sup>10</sup>

Gregory says it can be obtained after the morphine has been precipitated with calcium chloride:

This alkaloid is obtained as above described, from the mother-liquor of the precipitated morphine, which, being evaporated, deposits a mixed hydrochlorate of morphine and codeine. This salt being purified, is acted upon by potash, which dissolves the morphine, while the codeine is left as a viscid mass, which soon becomes hard and crystalline. It is purified by solution in ether ....<sup>11</sup>

Codeine can be prepared directly from opium with potash or indirectly from the morphine and codeine mix which is then separated using calcium chloride. In the 21st century it is more cost effective to prepare it via methylation from morphine.

### 3. LIME, AMMONIA AND THEBAINE

Thebaine is present in opium but in concentrations often of less than one percent. It is not used medicinally but is used for the semi-synthesis of other compounds, such as codeine or oxycodone.<sup>12</sup>

Kane (1842) has a brief recipe (*italics added*):

The watery infusion of opium being heated with milk of *lime*, so that the morphia may rest dissolved, the precipitation is to be washed with water until it becomes white, and then dissolved in a dilute acid. From this solution thebain [sic] is precipitated by *ammonia*. The precipitate being dissolved in ether, and the solution evaporated, pure thebaine crystallizes in colourless short rhombic prisms, which taste sharp and styptic, and have a strong alkaline reaction. ... By acids thebaine is decomposed, a resinous substance

---

<sup>10</sup> Kane (1842), pp. 1063-1064 (GB).

<sup>11</sup> Gregory, William. A Handbook of Organic Chemistry. Fourth edition. London: Walton and Maberly, 1856, p. 420 (GB).

<sup>12</sup> Schiff, p. 14.

and a salt of ammonia being formed. In its outer characters it completely resembles narcotin [sic] ....<sup>13</sup>

#### 4. PAPAVEREINE

First isolated from opium by Merck in 1848, "the amount of papaverine obtained from opium is small (0.5-1.5 percent):"

Papaverine is a direct smooth muscle relaxant independent of muscle innervation, particularly if the muscle has been contracted due to vasospasm. ... The compound is used therapeutically as its hydrochloric salt ... as a topical gel in sexual dysfunction in order to obtain erection in patients with spinal cord injuries.<sup>14</sup>

### B. OTHER PLANT ALKALOIDS

In the decade after Serturner's papers were published, many of the same methods for extracting the morphine alkaloid from opium were put to use extracting the alkaloids of various other medicinal plants: "During the next ten years no less than 10 alkaloids were isolated from vegetable drugs, most of them by pharmacists."<sup>15</sup> Lime was sometimes used as a part of these extraction processes.

#### 1. LIME AND BRUCINE

Pelletier and Jean Bienaimé Caventou (1795-1877) extracted brucine (then called brucia) from the bark of *Brucea antidysenterica* (J. F. Miller 1779-1780).<sup>16</sup> Henry (1831) gives a recipe (italics added):

The bark was first digested in sulphuric ether, and then in alcohol; the alcoholic solution evaporated: and the dry residuum dissolved in water. This solution was saturated with oxalic acid, and evaporated to dryness. Alcohol,

---

<sup>13</sup> Kane (1842), p. 1064 (GB).

<sup>14</sup> Schiff, p. 15.

<sup>15</sup> Sonnedecker, p. 361 (GB).

<sup>16</sup> Henry, 1831, p. 262 (GB);

<http://ravenel.si.edu/botany/ing/INGsearch.cfm?searchword=Brucea>.

digested on the residue, took up the colouring matter, and left the oxalic of brucia pure. This salt was decomposed either by *lime* or magnesia, which formed insoluble salts with the oxalic acid, and left the brucia soluble in water, of which it requires 500 parts at 212 degrees, and 850 at common temperatures.<sup>17</sup>

## 2. LIME AND ATROPINE

M. Brandes experimented on the leaves of *Atropa belladonna* (Linnaeus 1753),<sup>18</sup> finding that "pure alkalis precipitated, from the decoction of the leaves in water, a substance which had alkaline properties like morphia (*italics added*):"

He boiled two pounds of the dried leaves in repeated quantities of water, mixed the decoctions, and added a little sulphuric acid, which rendered the solution thinner, and enabled it more readily to pass the filter. The decoction was then supersaturated with potassa, by which he obtained a precipitate that, after being washed with pure water and dried, weighed 89 grains. It consisted of small crystals, from which, by repeated solution in acids and precipitation by alkalis, the new alkaline substance, *atropia*, was obtained in a state of purity. It has since, however, been shown by M. Runge (*Ann. de Chem. et de Ph.* xxxii 32) that pure alkalis and *lime-water* decompose atropia, and that it is better to add hydrate of magnesia (precipitated from the sulphate by caustic potassa, and purified by copious washings) to the decoction of belladonna; to evaporate to dryness; and to extract the atropa from the dry mass, first reduced to powder, by boiling alcohol.<sup>19</sup>

A decade later, Kane gives a recipe prepared not from the leaves but from the roots (*italics added*):

This alkaloid exists in all parts of the atropa belladonna but most abundantly in the roots. To prepare it, the fresh roots are to be powdered and digested in alcohol, of sp. gr. 0.820. The liquor obtained is to be mixed with *lime*, in the proportion of one part to twenty-four parts of roots and laid aside for twenty-four hours with frequent agitation; the mixture is then filtered, and the deposit treated with dilute sulphuric acid. The filtered solution is distilled,

<sup>17</sup> Henry, 1831, p. 262 (GB).

<sup>18</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?6051](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?6051).

<sup>19</sup> Henry (1831), p. 264 (GB).

and the spirit being thus removed, the residual liquor is concentrated by evaporation, until it equals one-twelfth of the roots employed. To this liquor, when cold, is to be added a strong solution of carbonate of potash, until a dirty brown precipitate occurs, which is to be removed by the filter, and then more carbonate of potash added as long as any precipitation is fomed. This last, which is impure atropine, is to be washed with water, then dried, and dissolved in strong alcohol, the solution decolorized by boiling with animal charcoal, filtered and gradually evaporated, whereby the atropin [sic] separates in small white silky prisms.<sup>20</sup>

### 3. LIME AND CINCHONINE

Dr. Andrew Duncan of Edinburgh was the first to suggest there was an active principle in cinchona. Dr. Gomes of Lisbon was the first to exhibit it in crystalline form, having obtained it from the bark of *Cinchona condaminea* (Bonpland 1808).<sup>21</sup> Badollier also developed a method for extracting it but Mr. Brande devised a simpler process (*italics added*):

A pound of bruised bark is to be boiled in about a gallon of water, to which three drachms of sulphuric acid have been previously added. A similar decoction is to be repeated with about one half the quantity of liquid, and so on till all the soluble matter is extracted. The decoctions are then to be mixed together and strained, and powdered *hydrate of lime* to be added, in proportion somewhat greater than is required to saturate the acid. From the precipitate (a mixture of cinchona and *sulphate of lime*) repeated boilings for some minutes with alcohol, decanting the fluid while hot, separate the cinchonina, which may be obtained by distilling off the alcohol at a very gentle heat.<sup>22</sup>

### 4. LIME AND QUININE

According to Sonnedecker,

---

<sup>20</sup> Kane (1842), p. 1073 (GB)

<sup>21</sup> From [www.plantamed.com.br/plantaservas/generos/Cinchona.htm](http://www.plantamed.com.br/plantaservas/generos/Cinchona.htm).

<sup>22</sup> Henry, 1831, pp. 266-267 (GB).

Cinchona bark had been brought from the Americas to Europe in the 17th century [and] was used to treat 'intermittant fevers' and various other conditions. In the labs of their pharmacy, Pelletier and Caventou isolated the active constituent quinine from the bark. Clinical tests by Paris physicians indicated that quinine sulfate was the most effective antimalarial agent.<sup>23</sup>

Henry (1831) writes that Pelletier and Caventou extracted and isolated quinine from *Cinchona cordifolia* (Mutis 1793)<sup>24</sup> in 1827. According to Henry, it "may be separated by processes precisely analogous to those by which cinchona is obtained."<sup>25</sup>

M. Henry fils and Plisson, both pharmacists at *la Pharmacie centrale des Hospiteaux civils*, presented a paper at *l'Académie royale de Médecine* in 1827 that discussed various methods of obtaining quinine from cinchona bark.<sup>26</sup> They began with a kilogram of royal yellow cinchona bark, though they say that gray or red bark will do as well. They boiled it with a little sulfuric acid and added lead hydrate which was then separated out. After filtering, they wrote, "the quinine was precipitated by means of a very small excess of lime."<sup>27</sup> After noting some basic conclusions, such as that "ammonia, lime-water, etc. separate the one and the other, quinine and cinchonine,"<sup>28</sup> they decided to do the experiment a second time, but without using the acid and the lead.

This was because the "use of acids and metal oxides in the extraction of alkaloids has made many able chemists think that the alkalinity of these new first principles is derived perhaps from a reaction caused by the agents being used."<sup>29</sup> As discussed

<sup>23</sup> Sonnedecker, p. 361 (GB).

<sup>24</sup> From [www.plantamed.com.br/plantaservas/generos/Cinchona.htm](http://www.plantamed.com.br/plantaservas/generos/Cinchona.htm).

<sup>25</sup> Henry, 1831, p. 267 (GB).

<sup>26</sup> Henry and Plisson. "*Mémoire pour faire suite à l'histoire de la Quinine, de la Cinchonine et de l'Acide quinique*," *Annales de Chimie et de Physique*, eds. Gay-Lussac and Arago, vol. 35. Paris: Chez Crochard, 1827, p. 165 (GB).

<sup>27</sup> Henry and Plisson (1827), p. 168 (GB). Originally, *On filtre, et la quinine est précipité au moyen d'un très-petit excès de chaux*.

<sup>28</sup> Henry and Plisson (1827), p. 173 (GB). Originally, *L'ammoniaque, l'eau de chaux, etc., séparent de l'un et l'autre la quinine et la cinchonine*.

<sup>29</sup> Henry and Plisson (1827), p. 177 (GB). Originally, *L'emploi des acides et des oxides métalliques dans l'extraction des alcaloïdes avait fait penser à*

previously, the techniques of alkaloid extraction had only been widely known for a decade and many chemists still "doubted the prior existence of the alkalinity of these first principles and attributed it to a reaction with the substances employed for their extraction."<sup>30</sup>

This was the same problem Robinet had confronted with his saline extractions of morphine from opium:

Earlier, in order to respond to this objection, M. Robinet, in a work on the use of neutral salts in vegetable analysis, gave some plausible enough proofs of the prior existence of these alkaloids, in forming organic alkaline salts by double decomposition. His memoir having been the object of many disputes, we believed that we ought to act upon the cinchonas in a manner closely analogous to the methods practiced by our colleague M. Robinet, but isolating as much as possible beforehand the colored matter.<sup>31</sup>

Henry and Plisson then describe their experiment (*italics added*):

Having boiled yellow cinchona bark in distilled water, and reduced it to a syrup, we added, as was said previously, some cold water, then the deposit was separated by a filter and the liquor was boiled with *animal glue*. It was made to evaporate in a water bath to a soft extract, and it separated with the aid of alcohol at 35 degrees. The quinate of quinine deposited and a little of the yellow coloring matter. This product, evaporated, was lightly acid. We then saturated it with care using several pieces of *lime carbonate*, then

---

*plusieurs habiles chimistes que l'alkalinité de ces nouveaux principes immédiats provenait peut-être d'une réaction opérée par les agents mis en usage.*

<sup>30</sup> Henry and Plisson (1827), p. 166 (GB). Originally, *les autres doutèrent de la préexistence de l'alkalinité de ces principes immédiats, et l'attribuèrent à la réaction des substances employées pour leur extraction.*

<sup>31</sup> Henry and Plisson (1827), p. 177 (GB). Originally, *Déjà, pour répondre à cette objection, M. Robinet, dans un travail sur l'emploi des sels neutres dans l'analyse végétale, avait donné des preuves assez plausibles de cette préexistence alcaline, en formant des sels à base organique par double décomposition. Ce Mémoire ayant été l'objet de plusieurs contestations, nous avons cru devoir agir sur les quinquinas d'une manière assez analogue à celle mise en pratique par notre confrère M. Robinet, mais en isolant autant que possible d'avance la matière colorante.*



reduced it and filtered it successively with alcohol and water (it contained no trace of calcareous salt). We added to the clear liquor a solution of *neutral* potassium oxalate. This resulted at once in quinine oxalate which was purified and some potassium quinate. The oxalate being mixed with a pink and yellow colored matter, we first had difficulty making it crystallize; nevertheless, this was achieved.<sup>32</sup>

Animal glue was used to help remove the insoluble parts of the plant, a technique adapted from salt production:

Animal jelly and gluten, blood, white of egg and glue, have been used. These substances being mixed with the brine, coagulate with the heat; and in this way entangling the insoluble matters of the brine gradually rise to the surface, in the form of a thick scum, which being removed, the brine is left clear.<sup>33</sup>

Egg white and sheep or bullock's blood was also particularly helpful in removing impurities from salt brine: "As the heat increases the albumen of the eggs or blood coagulates and rises to the surface, bringing with it all or the greater part of the solid impurities of the salt-water."<sup>34</sup>

---

<sup>32</sup> Henry and Plisson (1827), pp. 177-178 (GB). Originally, *Ayant donc fait bouillir le quinquina jaune dans l'eau distillée, et rapproché en sirop le produit, on y a versé, comme il a été dit déjà: de l'eau froide, puis le dépôt séparé par le filtre, la liqueur fut misc en ébullition avec de la colle animale; on fit évaporer au bain-marie, en extrait mou, et on sépara à l'aide de l'alcool à 35 (degrés), la quinate de quinine présumé et un peu de matière colorante jaune. Ce produit, évaporé, était légèrement acide. Nous l'avons saturé avec soin par quelques parcelles de carbonate de chaux, puis rapproché et repris successivement par l'alcool et par l'eau (il ne contenait point sensiblement de sel calcaire); on a versé alors dans la liqueur claire une solution d'oxalate neutre de potasse. Il en est résulté à la fois de l'oxalate de quinine qui a été purifié et du quinate de potasse. L'oxalate étant mêlé d'une matière colorante rosée et jaune, on eut d'abord assez de difficulté à le faire bien cristalliser; cependant on y parvint.*

<sup>33</sup> Tomlinson (1850), *The Natural History of Common Salt*, p. 58 (GB).

<sup>34</sup> Tomlinson (1850), p. 269 (GB).

The two researchers concluded that quinine had been alkaline in the plant and that the method of using acids and metal oxides did not cause this alkalinity (*italics added*):

There could be no doubt about the prior existence of the alkalinity of quinine, because by *double decomposition* one can obtain a new salt of quinine in a simple decoction of cinchona which had not been treated beforehand neither with acids nor with metal oxides, and that, moreover, we had isolated the natural combinations of quinine and quinic acid, using, it is true, lead oxide, which had not influenced anything, as the latter experiment proved.<sup>35</sup>

## 5. LIME AND SOLANINE

Kane (1842) gives a recipe for the extraction and purification from *Solanum dulcamara* (Linnaeus 1753)<sup>36</sup> and *Solanum tuberosum* (Linnaeus 1753)<sup>37</sup> of solanine (*italics added*):

This alkaloid is found in the berries of the *solanum nigrum*; in the berries, leaves, and stems of the *solanum dulcamara* (bitter-sweet), and *tuberosum* (potato). The powdered stems of bitter-sweet are to be digested with spirit of sp. gr. 0.865, mixed with one-third of sulphuric acid. The liquid is to be supersaturated with milk of *lime*, the spirit distilled off, the residue washed with water, and what remains treated with dilute sulphuric acid. From the solution thus obtained the solanine is to be precipitated by an alkali, washed with water, dissolved in alcohol, decolorized by animal charcoal, and then obtained by evaporation. It forms a brilliant white powder, of a slightly bitter, nauseous taste .... The injurious properties of unripe potatoes result from the

---

<sup>35</sup> Henry and Plisson (1827), p. 178 (GB). Originally, *Il n'y eut donc plus de doute sur la préexistence de l'alcalinité de la quinine, puisque par double décomposition on parvint à obtenir un nouveau sel de quinine dans une décoction simple de quinquina qui n'avait été traitée primitivement ni par les acides ni par les oxides métalliques et que, d'ailleurs, nous avons isolé les combinaisons naturelles de quinine et d'acide quinique, en employant, à la vérité, l'oxide de plomb, qui n'a pu influer en rien, comme l'expérience précédente le prouve.*

<sup>36</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?101313](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?101313).

<sup>37</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?103137](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?103137).

presence of this body. It exists abundantly in the early shoots (underground) and buds of the tuber.<sup>38</sup>

## 6. LIME AND CAFFEINE

Frederich Ferdinand Runge (1795-1867), a German analytical chemist is usually credited with the isolation and purification of a white crystalline substance, caffeine, in 1819. Some sources suggest he discovered quinine as well, normally given to Pelletier and Caventou.<sup>39</sup> Supposedly, he was given a box of Arabian mocha beans by Johann Wolfgang von Goethe, who was impressed with his previous work and encouraged him to study the subject.<sup>40</sup> Watts' *Dictionary of Chemistry* (1863) says caffeine was discovered in coffee by Runge in 1820 and that he published a report in 1821. The same alkaloid was discovered in tea (1827) and was shown to be identical to caffeine in 1838. It was also found in guarana (1840) and maté (1843). Liebig announced its composition in 1832.<sup>41</sup>

Robiquet and Boutron published an article, "*Sur le café*," in 1837 in the *Journal de Pharmacie* in which they discussed a number of experiments involving boiling water, alcohol of various gradations, ether, lead acetate, hydrogen sulfide, some drops of caustic soda, and gall nuts.<sup>42</sup> They also employed lime and alcohol to purify their precipitate (*italics added*):

When the precipitate is well strained, it is ground in a marble mortar with fifty grams of dry hydrate of *lime* and boiled twice with six deciliters of alcohol of 33 [degrees]. The alcohol is filtered hot and submitted to a distillation so as

<sup>38</sup> Kane (1842), pp. 1070-1071 (GB).

<sup>39</sup> Wikipedia; [www.chem.bris.ac.uk](http://www.chem.bris.ac.uk).

<sup>40</sup> Weinberg, B. A. and B. K. Bealer. *The World of Caffeine*. New York: Routledge, 2002, p. xix (GB).

<sup>41</sup> Watts, Henry. *A Dictionary of Chemistry*. Vol. I. London: Longman, Green, Longman, Roberts and Green, 1863, p. 707 (GB).

<sup>42</sup> Robiquet and Boutron. "*Sur le café*," *Journal de Pharmacie et des Sciences Accessoires*, vol. 23. Paris: Chez Louis Colas, 1837, pp. 101-103, 108 (GB).

to reduce its volume by five-sixths. The residue from the distillation is poured off into a crucible and evaporated at a slow heat. Upon cooling, one obtains some flat crystals of a greenish color, more or less dark, but this disappears completely with a new dissolution and recrystallization.<sup>43</sup>

Watts (1863) includes a precis of another recipe given by Vesmann (*italics added*):

Five pints of ground coffee are mixed with two pints of *slaked lime*, and the mixture is exhausted with alcohol in a displacement operation. The extract is then dried, pulverized, and again treated with alcohol; the alcohol separated from the extracts by distillation: *the fat oil which floats on the surface is removed*; the watery liquid is evaporated to the crystallising point; and the crystals of caffeine are pressed and decolorized by animal charcoal.<sup>44</sup>

### C. DISCUSSION AND QUESTIONS

Of a dozen different medicinal plants that these early 19th century European chemists and pharmacists extracted and isolated alkaloids from, work was particularly advanced with the opium of *Papaver somniferum*. Four of its five most prevalent alkaloids had been isolated by the middle 1830s. The methods used were comparatively simple, often using lime and salts, either in the process of extraction or purification.

These same techniques that had been used to extract and isolate morphine from opium were then applied to a large number of medicinal plants, from which their alkaloids were also extracted and isolated, including atropine, brucine, quinine, and caffeine. Some of these methods for extracting alkaloids depended upon the

---

<sup>43</sup> Robiquet and Boutron, pp. 108-109 (GB). Originally, *Lorsque le précipité est bien égoutté, on le triture dans un mortier de marbre, avec chaux éteinte à l'air, 50 grammes, et on le fait bouillir ensuite à deux reprises, avec alcool à 33 [degrees], 6 decilitres. L'alcool filtré bouillant est soumis à la distillation de manière à en retirer les 5/6 de son volume, et le résidu de la distillation est versé dans une capsule et évaporé à une douce chaleur. On obtient par refroidissement des cristaux palmés d'une couleur verdâtre, plus ou moins foncée, mais qui disparaît totalement par une nouvelle solution et cristallisation.*

<sup>44</sup> Watts (1863), p. 707 (GB).

introduction of strong bases, often including various forms of calcium, most notably lime, and certain salts. By 1839, when Lin began to soak his confiscated foreign opium in salt, lime and water, the techniques of alkaloid extraction from plants using just these ingredients was well understood and quite advanced, in Europe.

Against this background of extensive European knowledge of how to extract alkaloids from plants with comparatively simple ingredients such as salt and lime, it is easy to jump to the conclusion that Lin's knowledge of how to process the confiscated barbarian opium with salt and lime had to have arrived via Europe. However, these ingredients are comparatively simple and it is worth evaluating another, more ancient source of this knowledge.

## XIX TRADITIONAL METHODS

---

- XIX. TRADITIONAL METHODS
  - A. ALKALOID EXTRACTION
    - 1. LIME AND THE JUICE OF *PAPAVER SOMNIFERUM*
    - 2. LIME AND *ERYTHROXYLUM COCA*
    - 3. LIME AND *ARECA CATECHU*
    - 4. LIME AND *NICOTIANA RUSTICA*
    - 5. ASH AND *DUBOISIA HOPWOODII*
    - 6. LIME AND *PIPER METHYSTICUM*
  - B. FOOD PRESERVATION
    - 1. LIME AND SALT WITH EGGS
  - C. FOOD PREPARATION
    - 1. LIME AND CORN
  - D. DISCUSSION

*WHILE* 19th, 20th, and 21st century Western alkaloid extraction concentrated on interesting and innovative methods to extract and isolate the individual alkaloids in *Papaver somniferum* L. (as well as the alkaloids from other medicinal plants), traditional methods in use long before this era simply extracted the alkaloids from poppies and other plants without seeking to isolate the alkaloids one from another. Many of these methods used lime. It should also be noted that some traditional methods use lime and salt both in the preservation and preparation of foods.

## A. ALKALOID EXTRACTION

1. LIME AND THE JUICE OF *PAPAVER SOMNIFERUM* (LINNAEUS 1753)<sup>1</sup>

The use of lime to extract the alkaloids of opium is very old. "Rhazes (ca. 850-975), for instance, recommended arsenic in asthma, lung diseases, skin diseases, ulcerations and with *unslaked lime and opium* for dysentery."<sup>2</sup>

2. LIME AND *ERYTHROXYLUM COCA* (LAMARCK 1786)<sup>3</sup>

Long before the commercial processing of cocaine, traditional methods also used lime to extract the alkaloids (*italics added*):

The leaves are masticated always mixed with an alkaline powder (vegetable ash, ground up seashells or *lime*), and the custom was considered merely an accessory until D. Paly, working in the laboratories of Yale University, showed that the addition of *calcium carbonate* increased by a factor of ten the concentration of cocaine (the principal alkaloid of the plant) in the blood stream.<sup>4</sup>

3. LIME AND *ARECA CATECHU* (LINNAEUS 1753)<sup>5</sup>

Almost unknown in the West, the chewing of betel is very popular in India, China, and much of Southeast Asia. Lime almost

<sup>1</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?7406377](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?7406377).

<sup>2</sup> Frankenberger, William T. Environmental Chemistry of Arsenic. New York: Marcel Dekker, Inc., 2002, p. 9 (GB).

<sup>3</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?15794](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?15794).

<sup>4</sup> Escobedo, Antonio. *Historia general de las drogas*. Madrid: Espasa-Calpe, S. A., 1998, p. 119n53. Originally, *Las hojas se mastican siempre mezclándolas con un polvo alcalino (cenizas vegetales, conchas trituradas o cal)*, y la costumbre se consideró meramente accesorio hasta que D. Paly, trabajando en las laboratorios de Yale, comprobó que el añadido de carbonato cálcico aumenta por diez la concentración de cocaína (el alcaloide principal de la planta) en el plasma sanguíneo.

<sup>5</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?3903](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?3903).

always accompanies the betel. The betel nut is the seed of the Betel Palm (*Areca catechu*) in which one finds the "presence of relatively high levels of psychoactive alkaloids" in particular arecaine and arecoline.<sup>6</sup> Betel leaf, however, comes from the betel pepper plant (*Piper betle*), not botanically related to the palm. In India, "the nut is cut into small pieces ... and the husk is wrapped in a betel leaf along with *lime* and may include clove, cardamon" and other spices for flavor, a mix commonly known as *paan*, particularly popular in northeast India and Pakistan. It is almost always chewed "with *lime* (calcium oxide or calcium hydroxide) to better extract the alkaloids."<sup>7</sup> Experienced chewers often mix it with tobacco. The effect of chewing betel nut is said to be similar to tobacco, that of a stimulant, mild intoxicant and an appetite suppressant.

This practice was common in China in the 18th century in Hunan province. Zhu Gong mentions that "the Miao chewed the leaves of the betel-pepper with the betel nut and *lime* as a recreational drug."<sup>8</sup> A century later, Lin also makes reference to the practice as being common in Guangdong Province in his edict of proposed new regulations to the Chinese:

It is said that in these regions there are pestiferous exhalations, the injurious effects of which can be entirely avoided by the use of betel-nut and dried tobacco; and to abridge your expenditures for something which is exactly suitable to your mouths, and which furthermore does not violate the prohibitory regulations, why not therefore exchange that (opium) for these?<sup>9</sup>

#### 4. LIME AND *NICOTIANA RUSTICA* (LINNAEUS 1753)<sup>10</sup>

When tobacco arrived in Java, it was added to the betel chew with lime<sup>11</sup> but there is also evidence of the use of lime being used with tobacco alone (*italics added*):

---

<sup>6</sup> Found at <http://en.wikipedia.org>.

<sup>7</sup> Wikipedia, *ibid*.

<sup>8</sup> Dikötter, et al., p. 84.

<sup>9</sup> Shuck, *Portfolio Chinensis*, p. 18 (GB).

<sup>10</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?300393](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?300393).

<sup>11</sup> Dikötter, et al., p. 25.



Another mystery in the history of tobacco use concerns the chewing of the plant with *lime* by the Haida and Tlingit peoples of the north-west coast. Chewing tobacco was a comparatively unusual habit in traditional North American Indian societies and the use of *lime* even more so.<sup>12</sup>

5. ASH AND *DUBOISIA HOPWOODII* (F. MUELL 1876)<sup>13</sup>

Ashes are a source of a strong alkali and the aborigines of Australia have traditionally used them to help extract the alkaloids from pituri: "In nearby Australia, pituri (*Duboisia hopwoodii*) is chewed, mixed with ashes, in Queensland and the southern part of the continent."<sup>14</sup>

6. LIME AND *PIPER METHYSTICUM* (G. FORST 1786)<sup>15</sup>

While betel is chewed with "lime from burned coral or shells in Melanesea, Malaysia and southern India ... (t)here are regional variations such as the substitution of *Piper methysticum* leaf or fruit (kava) in Melanesia for *Piper betel* leaves."<sup>16</sup>

In general, "(l)ime (or similar alkali preparations) is added to a number of ... substances throughout the world as it releases more of the psychoactive properties of the plant in question."<sup>17</sup>

## B. FOOD PRESERVATION

There are many ingenious methods of food preservation (now forgotten by those who live with refrigerators in their kitchens)

<sup>12</sup> Rudgley, Richard. The Encyclopedia of Psychoactive Substances. New York: Little, Brown and Co., 1998 found at [www.biopsychiatry.com/tobacco](http://www.biopsychiatry.com/tobacco).

<sup>13</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?14732](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?14732).

<sup>14</sup> Murier, Horace. "Parallelism in Alkaloid-Alkali Quids" in American Anthropologist, New Series, Vol. 41, No. 4 (Oct-Dec, 1939), pp. 617-619 found at <http://links.jstor.org>.

<sup>15</sup> From [www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?28587](http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?28587).

<sup>16</sup> Murier, Horace, p. 617 found at <http://links.jstor.org>.

<sup>17</sup> Rudgley, Richard. The Encyclopedia of Psychoactive Substances. New York: Little, Brown and Co., 1978 found at [www.biopsychiatry.com/tobacco](http://www.biopsychiatry.com/tobacco).

including the boiling, baking, smoking and spicing of meats, for example. But among the most ancient are simple methods using salt and lime.

### 1. LIME AND SALT AND EGGS

The Chinese long ago mastered the art of preserving eggs using lime and salt in their production of the so-called "100 year-old eggs" and sometimes "1000 year-old eggs." The origin of the method "for creating century eggs likely came about through placing eggs in mud made from alkaline clay and water in order to preserve eggs in times of plenty."<sup>18</sup> Traditionally, the plaster is made from wood ash, quicklime and salt according to the following recipe (*italics added*):

(T)his process starts with the infusion of three pounds of tea in boiling water. To the tea, three pounds of *quicklime* (or seven pounds when the operation is performed in winter), nine pounds of *sea-salt*, and seven pounds of wood ash from burning oak is mixed together to form a smooth paste. Each egg is then individually covered by hand, with gloves being worn to prevent the corrosive action of the lime on skin.<sup>19</sup>

### C. FOOD PREPARATION

The use of lime in food preparation is a traditional practice still in use in many parts of the world: "Treatment of cereals and other foodstuffs with lime is a common practice in many cultures."<sup>20</sup>

### 1. LIME AND CORN

According to Garritz, calcium oxide or quicklime, was used in prehispanic Mexico in the *mixtamalization* of corn (*italics added*):

---

<sup>18</sup> From [http://en.wikipedia.org/wiki/Century\\_egg](http://en.wikipedia.org/wiki/Century_egg).

<sup>19</sup> Wikipedia, "Century egg;" *italics added*.

<sup>20</sup> Johan, K. and K. Ahmad. "Detoxification of lathyrus sativus," *Food and Nutrition Bulletin*, vol. 6, no. 2, June. Tokyo, Japan: United Nations University Press, 1984. Found at [www.unu.edu/unupress/food/8F062e/8F062E07.htm](http://www.unu.edu/unupress/food/8F062e/8F062E07.htm).

The corn is boiled in water with *quicklime* and after it becomes soft, is ground to obtain the dough from which the tortillas are made. The alkaline solution resulting from this process of mixtamalization, called *nejayote*, is strongly biocidal and is still being used to fight mange and to clean the wounds of domestic animals.<sup>21</sup>

The same word, *cal*, in Spanish, appears to be used (like the English word, lime) to designate both quicklime and slaked lime, or *cal viva* and *cal muerta* (*cal apagada*). Garritz says *cal viva* or quicklime (CaO) was formerly used for this process; the website [www.answers.com](http://www.answers.com) says calcium hydroxide (Ca(OH)<sub>2</sub>) is used today:

In North American and Latin American cooking, calcium hydroxide is called "*cal*." Corn cooked with *cal* becomes *mixtamal* which significantly increases its nutritional value, and is also considered tastier and easier to digest.<sup>22</sup>

Slaked lime (calcium hydroxide) dissolved in water is called simply lime water.<sup>23</sup>

#### D. DISCUSSION

In the traditional extraction (not the isolation) of the alkaloids of medicinal plants, lime and other alkaline preparations again have a long and varied history. Lime and salt are traditional ingredients in many parts of the world in food preservation and preparation.

---

<sup>21</sup> Garritz, A. and Chamizo, J. A. *Química*. Mexico, D. F.: Addison Wesley, 1994, p. 695. Originally, *el grano se hierva en agua con cal y despues se ablandarse se muele para obtener la masa con la que se elaboran las tortillas. La solucion alcalina resultante del proceso de nixtamalizacion, llamada "nejayote" tiene un gran poder biocida y se utiliza aún para combatir la sarna y limpiar las heridas de los animales caseros.*

<sup>22</sup> From [www.answers.com](http://www.answers.com).

<sup>23</sup> From [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm).

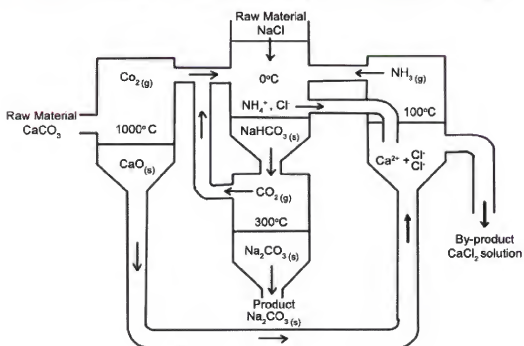
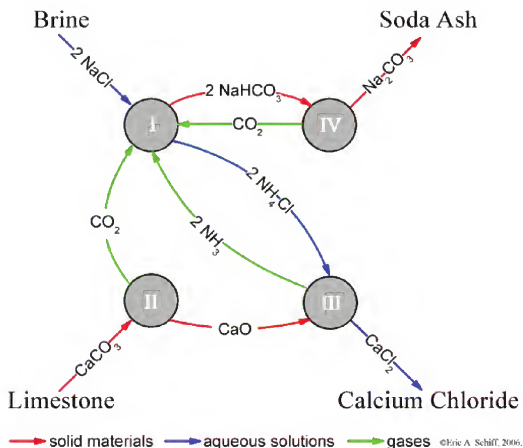
## PART FOUR THE CANTON EXPERIMENT

---

*H*AVING examined what did not happen, the different versions of what probably did and a little of the history of alkaloid chemistry, there now exists sufficient context within which to examine the actions of Commissioner Lin with the surrendered foreign opium. The many similarities with the previously discussed chemical methods of three different centuries suggest that it is worth while to consider what Lin did with the surrendered barbarian opium not from the viewpoint of destruction but from that of an extraction from opium of its alkaloids. In order to have obtained such a result, Lin would have needed knowledge, ingredients, equipment and a recipe.



Diorama, Hong Kong Museum of History



Schematics of the Solvay Process

## XX THE KNOWLEDGE

---

- XX. THE KNOWLEDGE
  - A. 19TH CENTURY EUROPEAN SOURCES
    - 1. CANTON REPORTS
    - 2. LIN'S CURIOSITY
      - a. ABOUT THE WEST
      - b. ABOUT FOREIGN OPIUM
  - B. 19TH CENTURY CHINESE SOURCES
    - 1. LIN'S CURIOSITY ABOUT CHINESE OPIUM
    - 2. THE CHINESE PURIFIERS
  - C. DISCUSSION AND QUESTIONS

*SPECULATION* is a vice. Although not specifically necessary for an understanding of the workings of Lin's giant chemistry set, the question of where Lin may have received his knowledge of how to extract the alkaloids from opium is certainly worth some consideration. Beyond the possibility that he invented it independently or derived it from traditional sources, there were both 19th century European and Chinese sources of knowledge for extracting alkaloids from opium.

### A. 19TH CENTURY EUROPEAN SOURCES

To argue that Lin received his knowledge from Western sources, it would be necessary but not sufficient to show that the European experiments in the first four decades of the 19th century would have been known at Canton and that Lin could have known of them, also.

## 1. CANTON REPORTS

The developments in European alkaloid extraction from the juice of *Papaver somniferum* did not go unnoticed in faraway Canton, at least among the foreigners. In June 1837, the Reverend E. C. Bridgman, writing in Canton, reviewed volumes 2 and 3 of Murray's *Historical and Descriptive Account of China* in his *Chinese Repository*. He included the following quote (italics in the original):

It occurs to us, that it may be possible to introduce among the Chinese the *sulphate*, or other natural salt, of *morphia* as a substitute for crude opium, which, in its present state, is a manufacture of about the same degree of refinement as pitch or tar. ... Now, if the well-prepared article, which contains the essence of the drug in about one sixteenth part of the weight of the raw material, could be introduced, many advantages would follow: - it would be cheaply and conveniently transported to China with little risk of seizure, - the natives would be saved their own imperfect and wasteful operation, - and they would be supplied with a more wholesome commodity, which might be conveyed to them at a smaller cost than even the precious metals. Britain would also become the seat of a new and extensive branch of manufacture ...<sup>1</sup>

By the middle 1830s, the replacement of opium with morphine had already begun in Europe and the Chinese market was now under consideration.

An article entitled "Opium, Narcotine and Muriate of Narcotine" was published in the *Canton Register* of 25 September 1838, originally published in *The India Gazette* of 11 July 1838.<sup>2</sup> The author, O'Shaughnessy, is conversant with the "chemical researches on opium, instituted by Derosne, Robiquet and others (that) led to the discovery of its narcotic base, *morphia*, in 1818, and of another crystalline principle which, though totally destitute of

---

<sup>1</sup> *CR*, vol. 6, pp. 66-67 (MD); Murray, 1836 *Historical and Descriptive Account of China*, vol. 3, pp. 63-64 (GB). Pages 62-63 are conspicuously missing. See Murray, 1843, vol. 3 (GB) for the missing pages.

<sup>2</sup> O'Shaughnessy. "Opium, Narcotine, and the Muriate of Narcotine," *Canton Register*, Tuesday, 25 October 1838, vol. 11, No. 39, p. 156 (University of Melbourne, Australia).

narcotic properties, was very inaptly termed *narcotine*."<sup>3</sup> He also states that he had experimented with narcotine on some pupils at the Medical College and encloses a report by Dr. Stewart, Superintendent General of Vaccine who tried it on nine cases of congestive fevers, believing it to be a "substitute for quinine" and that it "possesses over the bitter many attributes which render it both a safer and more generally useful remedy in all the fevers of Bengal."<sup>4</sup> A small article on the front page of the same issue gave news of the use of narcotine in Britain:

Opium yields several alkaloid substances, one of which named narcotine was tried by Dr. Roots and Mr. Jetson in a few cases of mild Lincolnshire ague in 1832, with effects similar to those produced by quinine.<sup>5</sup>

The editor of the *Register* (Slade) appended a recipe using two pounds of opium and twenty pounds of alcohol "for obtaining pure narcotine, which we publish for the purpose of laying it before our medical friends in China" (*italics added*):

Rub them well up together in a large mortar adding the spirit by degrees until the opium is exhausted of its soluble parts. Decant the solution and press insoluble part. To the alcoholic solution add as much ammonia as renders the liquid slightly turbid. Distill from a common alembic till 15 lbs. of the alcohol are recovered. Draw off the fluid in the still and set it aside to cool. On cooling it deposits a mass of coloured crystals composed of narcotine, meconate of ammonia and resin. Wash with water which dissolves the meconate of ammonia, then with one quart of water and one drachm of muriatic acid, which dissolves the narcotine and leaves the resin - filter. The solution which is of a rosy color is to be evaporated to dryness. The muriate of narcotine thus prepared is a transparent resinous mass, of a rosy color, brittle vitreous texture, very soluble in distilled water and spirits, and intensely bitter. A beautifully crystalline muriate of narcotine may be prepared by precipitating the muriate thus made, by ammonia, and dissolving the precipitate in boiling

---

<sup>3</sup> O'Shaughnessy, p. 156 (UM), *italics* O'Shaughnessy.

<sup>4</sup> O'Shaughnessy, "Dr. Stewart's Report," *Canton Register*, 25 October 1838, p. 156 (UM).

<sup>5</sup> "Substitutes for sulphate of Quinine," *Canton Register*, Tuesday, 25 October 1838, vol. 11, No. 39, front page (UM).



alcohol from which the *narcotine separates in fine crystals* as the solution cools.<sup>6</sup>

The recipe uses alcohol, ammonia and hydrochloric acid but there is no mention of salt or lime.

An article entitled "The Chinese Method of Preparing Opium for Smoking, described in a series of experiments" made by "a Chinese artist"<sup>7</sup> was published in the August 1837 issue of the *Chinese Repository*, originally published in the *Canton Courier* of 21 April 1832. Experiment number five reads:

Eight ounces troy of Bombay opium was infused in 6 lbs. of proof spirit, and filtered after 12 days' digestion. The residuum, dried to about the same consistency as the opium, weighed 4 oz. 4 dwts. 16 grs., the extract, 6 oz. 19grs.; total, 10 oz. 5 dwts. 11 grs. Now two ounces and a quarter appear to be gained, equal, probably, to the fluid contained in the extract.<sup>8</sup>

Experiment number seven uses the residue of experiment number five and produces a very interesting result (*italics added*):

The residuum of exp. v. was infused in 30 oz. of alcohol, and after remaining two days, was made to boil, and strained in that state. Upon cooling, the filtered liquid deposited, on the sides of the bottle, *regular crystals of the salt of opium*, which, being soluble in 100 parts of spirits of wine, and the liquor being saturated, gave the following,  $30 \times 480 = 14,400$  [which divided by]  $100 = 144$  grs.<sup>9</sup>

In none of the experiments was described the use of either salt or lime for obtaining regular crystals of the salt of opium.

Even without reading the foregoing material, the Western opium traders at Canton probably would have known of the relatively recent European advances in the technology of alkaloid

---

<sup>6</sup> O'Shaughnessy, p. 156 (UM).

<sup>7</sup> *CR*, vol. 6, p. 198 (GB); volume 6 labelled as volume 4 (GB), also appended to volume 8 (GB).

<sup>8</sup> *CR*, vol. 6, p. 199 (GB); but volume 6 also labelled correctly (GB), a major problem with GB.

<sup>9</sup> *CR*, vol. 6, p. 199 (GB); mislabelled, poorly indexed in GB.

extraction from opium. Sertuerner's work was widely reported after 1817. Morson and Merck were both manufacturing morphine in large amounts in the 1820s and early 1830s. Since morphine was initially sold as a substitute for opium, it would have been in the best interests of the traders to know of their competition. Since morphine was also initially marketed as a cure for opium addiction, it would have been in the best interests of the anti-opium, proselytizing medical missionaries to know this as well.

## 2. LIN'S CURIOSITY

But could Lin have known of these European developments? Lin was Chinese. China was closed, meaning it had very little official contact with the West. Only the port of Canton was supposed to be open for a limited amount of trade. Gutzlaff continually complains that his unofficial visits to other parts of China were officially discouraged. What could Lin have known of these relatively new processes in Europe?

### a. ABOUT THE WEST

Unlike other Chinese mandarins, Lin was very curious about the West, never showing, says Shuck (1840) "that contempt for foreign literature which has usually characterised his brother officers."<sup>10</sup> Lin was very open about his curiosity with the barbarians. In a dispatch to the emperor, Lin wrote

At this crucial phase of our effort to ward off the foreigners, we must constantly find out all we can about them. Only by knowing their strength and their weakness can we find the right means to restrain them.<sup>11</sup>

One of his methods of finding out about the West was through translation:

---

<sup>10</sup> Shuck, *Portfolio Chinensis*, p. 180 (GB).

<sup>11</sup> Waley, p. 96.

The overriding concern of some statecraft literati-officials was to understand the maritime West. But how? For Commissioner Lin Tse-hsu, an effective way was through translation. When he was in Canton in 1839, he ordered the translation of foreign newspapers from Canton, Macao, Singapore and India.<sup>12</sup>

Fairbank adds he also "ordered the translation of manuals on Western gun-making."<sup>13</sup>

Against this, Waley writes that Lin did not begin his work on translating Western documents until after June 1839:

Lin's own attempt to improve his knowledge of the West probably began in the summer of 1839, during the lull that followed the destruction of the foreign opium. We have seen that in July he asked for a translation of Vattel's Law of Nations, and in December he presented translated extracts from Thelwall's The Iniquities of the Opium Trade. He also had extracts from Hugh Murray's Encyclopedia of Geography translated. In the summer of 1839 he set his translators to work on making extracts from European newspapers and periodicals published at Macao and Canton.<sup>14</sup>

As for when he learned of Vattel, it is important to be careful. Bridgman included Dr. Peter Parker's<sup>15</sup> "Tenth Report of the Ophthalmic Hospital, Canton, being for the year 1839" in the April 1840 issue of the *Chinese Repository*.<sup>16</sup> Case number 6565 was that of hernia, of "Lin Tsihseu, the imperial commissioner:"<sup>17</sup>

His first applications, during the month of July, were not for medical relief, but for translation of some quotations from Vattel's Law of Nations, with which he had been furnished: these were sent through the senior hong-merchant; they related to war, and its accompanying hostile measures, as blockades, embargoes, and etc.; they were written out with a Chinese pencil.<sup>18</sup>

<sup>12</sup> Fairbank, John King and Kwang-Ching Liu, editors. The Cambridge History of China. Volume 2, Late Ch'ing 1800-1911, Part 2. Cambridge, England: Cambridge University Press, 1980, p. 146 (GB).

<sup>13</sup> Fairbank, p. 149 (GB).

<sup>14</sup> Waley, pp. 96-97.

<sup>15</sup> *CR*, vol. 8, p. 624 (MD).

<sup>16</sup> *CR*, vol. 8, p. 628 (MD).

<sup>17</sup> *CR*, vol. 8, p. 634 (MD).

<sup>18</sup> *CR*, vol. 8, p. 635 (MD).

Waley is correct in that Lin asks for translations of parts of Vattel in July 1839, but Dr. Parker says that the volume had already been furnished, previously.

Lin had many translators on his staff though their abilities varied. Shuck (1840) writes: "He has in his employ three native interpreters, who engage in translating from English to Chinese."<sup>19</sup> Bridgman says there were four translators on his staff, not three. As noted earlier, he added a postscript to the description of his voyage to Chunhow that Lin had

in his service four natives, all of whom have made some progress in the English tongue .... (The fourth) is able to read and translate papers on common subjects, with much ease, correctness, and facility.<sup>20</sup>

Dr. Hill (from the shipwrecked *Sunda*) described the abilities of two of them:

The tedium of waiting so long was somewhat relieved by the conversation of the linguists and their assistants, one of whom appeared a very intelligent young man, and had been in London for nearly eight years along with the late Mr. Elphinstone. He speaks English remarkably well, much better, indeed, than any Chinese whom I have ever met with, and I regret much that he did not act as our interpreter with the *yum-chae*, as Atung stammered so much, and was so flurried, that we had great difficulty in understanding him.<sup>21</sup>

Lin did have some talent working for him and he may simply have wanted to check their work on important points, even perhaps to discover which of them was the best. This would be one benefit of obtaining a translation by a native speaker. It is at least possible to argue that these may not have been his first translations from Vattel because Dr. Parker does not say when Lin received his copy of the book.

<sup>19</sup> Shuck, *Portfolio Chinensis*, p. 180 (GB).

<sup>20</sup> *CR*, vol. 8, p. 77 (MD).

<sup>21</sup> *CR*, vol. 8, marked as p. 484 (MD); page 483 and 484 are mismarked in the original. The page sequence given is 481, 482, 484, 483, 485 but the narrative is continuous. What is marked 483 should be 484 and vice versa.

Although Waley says Lin did not begin his education regarding the West until the summer of 1839, Dr. Chang writes that it began much earlier:

In early 1830, Lin again reported to Peking. There he associated with Kung Tzuchen (1792-1841) and Wei Yuan (1794-1856) and organized the Hsuan-nan poetry club, which consisted of poets, reformers, and men with progressive views.<sup>22</sup>

This group of progressive scholars adopted a new approach to practical politics and economic problems called the *Ching-shih chih-yung chih-hsueh*, or "knowledge for the development of the state and for practical use in the world."<sup>23</sup> Their interests embraced the practical fields of political affairs, economy, history, geography, and science and were not limited to the boundaries of China.<sup>24</sup> Lin himself states in his first edict to the foreign traders of 18 March 1839 (*italics added*):

I, the high commissioner, having my home in the maritime province of Fuhkeen, and consequently *having early had intimate acquaintance with all the arts and shifts of the outer foreigners*, have for this reason been honored by the great emperor with the full powers and privileges of a high imperial commissioner, who, having repeatedly performed meritorious services, is sent to settle the affairs of the outer frontier.<sup>25</sup>

On 12 October 1839 the British bark *Sunda* wrecked near the island of Hainan. On 16 December 1839 the Commissioner interviewed a few survivors.<sup>26</sup> Bridgman included an account by Dr. Hill, a surgeon from the ship, relating his interview with the Commissioner in the January 1840 issue of the *Chinese Repository*. Lin began by questioning the doctor closely:

---

<sup>22</sup> Chang, p. 122.

<sup>23</sup> Chang, p. 123.

<sup>24</sup> Chang, pp. 123, 257.

<sup>25</sup> *CR*, vol. 7, pp. 611-612 (MD).

<sup>26</sup> Chang, p. 137.

He then asked when we had left England? And whether any account of the disturbances in China had reached England previous to our departure? When and where did we first hear of them? How many days' sail is Anjier from China? Whether it is usual for vessels to call there on their way to China? What was the nature, and value of our cargo? And whether the vessel had been to China before?<sup>27</sup>

He shows Dr. Hill a number of Western documents:

In order to show us the iniquity of the opium trade, and its increase during the last few years, he handed us Mr. Thelwall's pamphlet, and a work upon China, from which the title page was torn (Davis' I think), a few extracts from which he requested us to read. Several portions of both works were translated into Chinese, and pasted on the corresponding page. He also had five or six E. I. Company's cards, showing the quantity of opium sold during the season. One of them which he handed us was marked Patna opium 12,046 (?) chests. March 1839, and signed, Trotter.<sup>28</sup>

The reference to "Davis' I think" is, in Waley's estimation, probably a copy of an 1836 London edition of *The Chinese* by John Davis (1795-1890), who is afterwards Governor of Hong Kong. Lin then shows Dr. Hill his second letter to the queen to be proofread:

He then handed us a letter addressed to the queen of England, written in their usual high flowing strain, at which I could scarcely command my gravity, which he observing, immediately asked if it was all proper? We said that it was only a few mistakes at which we smiled, whereupon he requested us to take it into an adjoining room and correct any errors we might find in it, and whither tea and refreshments would we [sic] sent us. The letter was a pretty long one, and written in a fair legible hand with a hair pencil. The subject of it was principally a lengthened disquisition on the opium trade, and its evil effects, and a hope that H. B. majesty would interfere and assist in putting a stop to it. Some parts of it we could make neither head nor tail of.<sup>29</sup>

---

<sup>27</sup> *CR*, vol. 8, marked as p. 483 (MD); page 483 and 484 are mismarked in the original. The page sequence given is 481, 482, 484, 483, 485 but the narrative is continuous. What is marked 483 should be 484 and vice versa.

<sup>28</sup> *CR*, vol. 8, marked as pp. 483, 485 (MD); which should be pp. 484-485.

<sup>29</sup> *CR*, vol. 8, p. 485 (MD).

Dr. Hill wrote that Lin was curious about everything, even interviewing

one of our boys ... and asking him a number of questions such as the following: his name, age, were his father and mother alive, was he fond of the sea? And etc. They likewise made him read a page or two of English, at which they were highly pleased.<sup>30</sup>

Lin even spends time "laughing and joking with his friends about the different parts of the English costume, which he minutely examined."<sup>31</sup>

Lin is also probably aware of either Bridgman's account of the foreign visit to Chunhow on 17 June 1839 or a laudatory article in the 20 July 1839 *Canton Press* because he refers to a report by foreigners in his apologia to the emperor (sent 24 Sep 1840). As well he could have been aware of Shuck's Portfolio Chinensis of 1840.<sup>32</sup> One of Lin's closest friends, Wei Yuan, received and collected Lin's translations in 1841 and "created a political geography of foreign nations, that appeared in 1844 under the title *Haiguo Tughi* (Illustrated Record of Maritime Nations)."<sup>33</sup>

#### b. ABOUT FOREIGN OPIUM

Beyond his general interest in Western law, geography, science and technology, Lin also shows that he has received information from someone as to where the foreign opium comes from and how it is processed before it reaches China. He knows that the opium is not grown in England but in India. In the first letter to the queen he suggests that she should be "in the nations under your dominion, forbidding its manufacture."<sup>34</sup> In the second letter, he expands on this:

<sup>30</sup> *CR*, vol. 8, p. 486 (MD).

<sup>31</sup> *CR*, vol. 8, p. 486 (MD).

<sup>32</sup> Waley, pp. 89, 97, 119, 129.

<sup>33</sup> Yang, Rui. The Third Delight: Internationalization of Higher Education in China. New York: Routledge, 2002, p. 30 (GB).

<sup>34</sup> *CR*, vol. 8, p. 11 (MD).

Moreover, we have heard that in London the metropolis where you dwell, as also in Scotland, Ireland, and other such places, no opium whatever is produced. It is only in sundry parts of your colonial kingdom of Hindostan, such as Bengal, Madras, Bombay, Patna, Malwa, Benares, Malacca, and other places where the very hills are covered with the opium plant, where tanks are made for the preparing of the drug ....<sup>35</sup>

As for where and when he received this knowledge, Lin had asked Dr. Hill of the shipwrecked *Sunda*:

the names of the places from whence the different kinds of opium were brought, and requested me to write them down for him which I did. On mentioning Turkey, he asked if it did not belong to America? Or form part of it? And seemed a good deal astonished on being told that it was nearly a month's sail distant.<sup>36</sup>

The place names in India then show up transliterated by their sounds into Chinese characters in the second letter to the queen. But all that has been demonstrated so far is that Lin shows interest in the West and barbarian opium, translates foreign documents and that the knowledge of European alkaloid extraction methods was available at Canton.

## B. 19TH CENTURY CHINESE SOURCES

Lin tells the emperor that he learned his new method of salt and lime after consulting with the Chinese purifiers, not the barbarians. If Lin's source of information for how to process the foreign opium was Chinese, it would still be useful to confirm that this information could have been available from Chinese sources and that Lin knew of it. Prior to his arrival in Canton, Lin had already demonstrated his curiosity not only about foreign opium but about Chinese opium as well.

---

<sup>35</sup> *CR*, vol. 8, pp. 500-501 (MD).

<sup>36</sup> *CR*, vol. 8, p. 486 (MD).



## 1. LIN'S CURIOSITY ABOUT CHINESE OPIUM

Lin's curiosity was not limited to the arts and shifts of the foreign barbarians. Nearly everything he encounters, he takes great care to examine minutely. In the middle of his long journey south to Canton, he must cross the "famous Eighteen Rapids" of the Kan river:

At this point the diary contains a long disquisition on the history of the rapids of the Kan river, showing that in early times their number had been far greater, but that later on conservancy work had increased the volume of water and submerged hundreds of large rocks.<sup>37</sup>

But this is just one more example of Lin's wide range of interests. Indeed, it would be strange if Lin were not curious about how opium was used in China.

Lin was specifically interested in the opium he confiscated in China while still Governor of Hu-Kwang. Lin's memorials on the subject to the emperor in 1838 were the "fullest and most painstaking."<sup>38</sup> Chang says that whether in major policies or minute details, it was Lin's practice to "investigate problems personally."<sup>39</sup> His memorials to the emperor in 1838 address the issues of proposed new penalties for opium-smoking, provincial and district surveys of the extent of the practice, public proclamations and time limits, civil and military corruption, personal enmity on the part of local constables, public destruction of the pipes and opium, how to do so using wutung oil and fire, and manners of trials for the accused. But he also covers the various kinds of opium bowls and pipes, whether new or old "with crust and grease long accumulated," who makes them and sells them, what the pipes are made of, whether wood or bamboo or sweet-cane, whether the bowls are made of clay or foreign porcelain, how and why the makers decorate them with

---

<sup>37</sup> Waley, p. 19.

<sup>38</sup> Waley, p. 13.

<sup>39</sup> Chang, p. 122.

"gold, jade, horn or ivory," and even the "great variety of pokers and knives" used to unblock the pipe.<sup>40</sup>

## 2. THE CHINESE PURIFIERS

Against this background of Lin's general interest in the subject, would this information on how to obtain the alkaloids from opium with salt and lime have been available in China? In fact, if Kuo's translation of Lin's words can be taken at face value, he did *not* receive his knowledge of this new processing method from the Westerners; instead, he received it from Chinese sources, specifically the Chinese purifiers of opium. How and when does Kuo say Lin learned of this new method from these purifiers?

To recap once more, in his edict of 18 Mar 1839, Lin wrote that the surrendered opium would be "burnt and destroyed" in the Morrison translation,<sup>41</sup> "publicly burned" in the Shuck translation.<sup>42</sup> In the first letter to Queen Victoria (March-April 1839) he wrote that the opium confiscated in China was "entirely committed to the flames, and consumed" and any new opium introduced would be "subjected to a like process of destruction" according to the translation Bridgman printed in the *Chinese Repository*.<sup>43</sup> In the second letter, Lin declares the opium was "utterly destroyed"<sup>44</sup> according to the Morrison translation and "destroyed by fire"<sup>45</sup> in Shuck's *Portfolio Chinensis*.

On 12 April he is asking permission to send it to Peking to be burned and one month later, on 13 May, his diary records him inspecting the excavation of his new tanks where he will not be burning it. On 19 May he is composing his apology to the spirit of the sea "for polluting the sea with the opium that he now proposed to liquify"<sup>46</sup> in Waley's words, that "all aquatic animals might take

<sup>40</sup> Kuo, pp. 219-226, 79-86.

<sup>41</sup> *CR*, vol. 7, p. 612 (MD).

<sup>42</sup> Shuck, *Portfolio Chinensis*, p. 91 (GB).

<sup>43</sup> *CR*, vol. 8, p. 11 (MD).

<sup>44</sup> *CR*, vol. 8, p. 498 (MD).

<sup>45</sup> Shuck, p. 132 (GB).

<sup>46</sup> Waley, p. 44.

refuge when the decomposed opium was thrown into the ocean."<sup>47</sup> Chang adds that this poem gives "some evidence of the gentleness of Lin's nature."<sup>48</sup> On the next page Dr. Chang records that Lin had a thief executed in front of the foreign visitors at Chunhow: "One man caught trying to carry off a small portion of opium was executed immediately."<sup>49</sup> In his proclamation of 29 May - 5 June, he makes it official: he is no longer thinking of burning it; he will mix it with lime and salt until it is "completely transmuted and destroyed" in the translation published by Bridgman.<sup>50</sup>

Sometime in the two months between 18 March and 13 May 1839, Commissioner Lin changed his mind as to how to dispose of the opium, and, if his letter to the emperor of 12 April is to be believed, in which he suggests it be sent to Peking to be examined and burned, the period was much shorter, only a month. Instead of burning it, he decided sometime during this month, according to the translations given, to "transmute," "melt," or "dissolve" it, and in the language of the sinologists, to "liquefy" or "decompose" it. It does not appear credible that he seriously ever considered sending it either overland or by sea to Peking. By 19 May, burning was no longer an option as "the charred remains might have been collected."<sup>51</sup> On 18 March, even on 12 April, this had not been a problem.

How did he hit upon this never-before-tried method of using water, salt and lime? Neither Fay nor Collis venture an opinion.<sup>52</sup> Waley doesn't consider where he got the idea.<sup>53</sup> "The method of destroying the opium was determined after extensive inquiry," writes Dr. Hsin-pao Chang, but he doesn't say with whom.<sup>54</sup> Chung writes: "He consulted a large number of knowledgeable people" and says he conducted "repeated consultations with his colleagues and

---

<sup>47</sup> Chang, p. 173.

<sup>48</sup> Chang, p. 173.

<sup>49</sup> Chang, p. 174.

<sup>50</sup> *CR*, vol. 8, p. 36 (MD).

<sup>51</sup> Waley, p. 45.

<sup>52</sup> Fay, pp. 160-161; Collis, pp. 230-231.

<sup>53</sup> Waley, pp. 47-51.

<sup>54</sup> Chang, p. 173.

experts" but once again does not say who they were.<sup>55</sup> His inquiries could not have been too lengthy or extensive because he made up his mind to change his method in the one month between 12 April and 13 May, if his diary and letters are taken as written. Dr. Tan Chung says that "[t]here were two ways of destroying it," but only mentions the first (*italics added*): "One was to boil the opium as the *opium dealers* did for opium extracts. When salt and lime were thrown into the boiler, the opium would be quickly and completely destroyed."<sup>56</sup> Dr. Chung suggests that Lin learned of this new method from the opium dealers.

Lin, with Governor-General Teng Ting-chen and Governor Iliang, wrote two memorials to the emperor describing the processing of the foreign opium. The first was sent 13 June when the job was approximately half-finished.<sup>57</sup> The dispatch was received in Peking on 8 July 1839.<sup>58</sup> According to Kuo's translation, he tells the emperor why he did not burn it (*italics added*):

As to the method of destroying the opium, we had also deliberated and experimented for a long time. The traditional practice of burning the drug, with wutung-oil mingled with it, is indeed a good method. But we learned that after the burning, there was *always much residue* remaining on the ground which experienced *purifiers of opium* could easily dig out and gain twenty or thirty per cent. By so doing, therefore, the evil still cannot be brought to an end.<sup>59</sup>

This had not been a problem before as Lin had simply thrown the remnants in the river.

Notice that the purifiers are able to obtain twenty or thirty percent of something from the residue dug out of the ground after an official opium burning. This recalls Barbier's experience with the burned opium at his Smyrna laboratory in 1930: "This opium, which

---

<sup>55</sup> Chung, p. 199.

<sup>56</sup> Chung, p. 199.

<sup>57</sup> Chang, p. 174.

<sup>58</sup> Kuo, p. 244.

<sup>59</sup> Kuo, p. 245; see also Barbier's lime recovery of morphine from burned opium, ch. 7, pgs. 84-85.

had been subjected to a fairly high temperature, had lost part of its volatile acids and the morphine was in a form insoluble in water (probably that of the base), but soluble in lime, and this enabled it to be detected by the assay."<sup>60</sup> Juxtaposed but spanning a century, these experiences suggest the Chinese purifiers also knew how to obtain some twenty or thirty percent of something valuable from burned opium by soaking the residue in a solution of lime. However, it must be remembered that this is Kuo's translation and the relevant lines do not occur in the original.

Lin then explains to the emperor how he discovered his new method, again mentioning the purifiers (*italics added*):

After extensive inquiry and consultation, we came to learn that there are two things which are the deadly enemies of opium - salt and lime. It is observed by *the purifiers of opium* that when mixed with salt and lime in the *process of purification*, the opium will never yield the oily paste desired. Therefore, the antagonistic tendencies of opium and these two things ought to be utilized for the purpose of abolishing the evil.<sup>61</sup>

The original online, without the lines added by Kuo, reads *chen2 deng3 guang3 zhi4 bo2 cai3* or roughly "your ministers collected numerous and extensive records," or "we sought advice from all sides." Kuo translates "deadly enemies;" the original reads *zui4 ji4* or literally "strongly avoid as taboo." Kuo translates "purifiers" but the original reads *fan2 yi3 yan1 tu3 jian1 gao1 zhe3* or roughly "according to all those who decoct (boil, sauté, pan fry) a paste from the smoking earth (opium)." Kuo translates salt but the original reads *yan2 lu3* or roughly "bittern," or "salt brine." Kuo translates "process of purification" but the original only has *ji2*, or roughly "in the act."<sup>62</sup>

<sup>60</sup> Barbier, Andre. "The Extraction of Opium Alkaloids," UNODC *Bulletin on Narcotics*, 1950, Issue 3, from [www.unodc.org/unodc/bulletin/bulletin\\_1950-01-01\\_3\\_page004.html](http://www.unodc.org/unodc/bulletin/bulletin_1950-01-01_3_page004.html).

<sup>61</sup> Kuo, p. 245.

<sup>62</sup> CBYWSM (TK), volume 7, page 7a, lines 9 and 10, from [www.cadal.zju.edu.cn/Reader.action?bookNo=02024402](http://www.cadal.zju.edu.cn/Reader.action?bookNo=02024402). A bittern is "the bitter liquid left after the crystallization of salt from brine" and is used chemically "as a source of

Two curiosities arise from this paragraph. One, it is the "purifiers" (decocters, boilers, pan-fryers, sautés) who have taught Lin this new method. Kuo's Lin tells the emperor that he was forced to change his method from fire and wu-tung oil because of these very same purifiers. Less than a year earlier he was proposing that dealers "should be subject to death penalties."<sup>63</sup> Dr. Chung thinks Lin learned his skills from these same dealers. Two, these purifiers who have caused him such trouble in the past have now taught him a method, not of recovering something valuable from opium using lime and a salt brine, but of destroying its value with lime and salt brine. Further, he not only trusts his new friends but also this recently acquired chemical theory of antagonists.

Are the "purifiers" dealers and what exactly is this process of "purification" that uses salt and lime? As Chung suggests, the opium that arrived from India was not smoked directly out of the chest. It was put through a preliminary process first. In his decree to the Chinese of Kwangtung province of 15 March 1839 Lin demands "both crude and prepared" opium.<sup>64</sup> He refers to "the establishments where the drug is prepared."<sup>65</sup> The emperor's original edict of 31 Dec 1838 appointing Lin as Imperial Commissioner also mentions the "buildings in which the opium is prepared."<sup>66</sup>

What exactly were the details of this preparatory process? In some references, this process is simply boiling. For comparison, the DEA's investigator in Southeast Asia reports that the same method is still in practice:

Before opium is smoked, it is usually cooked. Uncooked opium contains moisture, vegetable matter, and other impurities which detract from a smooth-smoking product. The raw opium which is collected from the pod is placed in an open pot of boiling water where the sticky glob of opium alkaloids

---

bromides, iodides and certain other salts." - from [www.yourdictionary.com](http://www.yourdictionary.com) and <http://dictionary.reference.com>.

<sup>63</sup> Kuo, p. 224.

<sup>64</sup> Shuck, p. 59 (GB).

<sup>65</sup> Shuck, p. 19 (GB).

<sup>66</sup> *CR*, vol. 7, p. 600 (MD).

quickly dissolves. The soil, twigs, and plant scrapings remain undissolved. The solution is strained through cheesecloth to remove these impurities. The clear brown liquid, sometimes called liquid opium, is actually opium in solution. This liquid then is reheated over a low flame until the water turns to steam. When the water has evaporated, a thick paste remains. This paste is called prepared opium, cooked opium, or smoking opium and it is dried in the sun until it has a putty-like consistency. ... Cooked opium is suitable for smoking or eating by opium users. Traditionally, there is only one group of opium poppy farmers, the Hmong, who often do not cook their opium before smoking. Most other ethnic groups, including Chinese opium addicts, prefer smoking cooked opium.<sup>67</sup>

Shuck adds the following note in the Portfolio Chinensis (1840):

Opium, as it comes from the foreign ships, is carried through a preparatory process of boiling before it is smoked. The preparing and smoking of it are carried on at different establishments. The *Yaou-kow*,<sup>68</sup> where it is stored and prepared, may be compared to the distillery, while the *Yin-kwan*, the bar-room where the fiery extract is consumed.<sup>69</sup>

There are many references from this period to Shuck's opium distilleries. In some cases the distillers are also arranging the financing and doing the smuggling. Kueiliang, Governor of Honan, mentions them (*italics added*): "If it can be found who are the interpreters who transmit the delivery warrant, *the distillers who collect the money*, the merchants who make the exchange, and the barbarian merchants who issue the warrant, they should all be

---

<sup>67</sup> DEA 20026, p. 9.

<sup>68</sup> This name appears as belonging to a broker in the memorial of Hsu Nai-chi (Heu Naetse), subdirector of the Court of Sacrificial Worship, presented to the emperor 17 May 1836: "The late governor Loo, on one occasion, having directed the Commodore Tsin Yuchang to cooperate with Teen Poo, the district magistrate of Heangshan, they captured Leang Heennee with a boat containing opium to the amount of 14,000 catties. He likewise inflicted the penalty of the laws on the criminals Yaoukow and Owkwon (both of them being brokers), and confiscated their property. This shows that the faithfulness in the enforcement of the laws is not wanting; and yet the practice cannot be checked (Chang, pp. 85-86; *CR*, vol. 5, p. 112)."

<sup>69</sup> Shuck, p. 177 (GB).

strictly convicted and punished."<sup>70</sup> Chang Yo-sung, Acting Governor of Hupeh, records them in this context (*italics added*): "The *native brokers* who had charge of the transaction were known as '*distillers*.'"<sup>71</sup> Teng Ting-chen, Governor-General of Liang-Kwang, speaks of "distilleries" in one of his memorials to the emperor (*italics added*): "The reason why the receiving ships loitered in our sea is no other than the lawless *smugglers from the distilleries*."<sup>72</sup> Teng Ting-chen continues, "We ordered that all distilleries should be searched, arrested, and confiscated, according to the law of the land ... upon the basis of the evidence as to where the distillery is located."<sup>73</sup> It is unclear, of course, how one "arrests" a distillery. It appears that the distillers are opium brokers or dealers who arrange finances and smuggle the opium from the receiving ships to the distilleries, where the opium is then further processed.

The distilleries were also called "furnaces." Bridgman records in his "Journal of Occurrences" for February 1835 that a new imperial order was published on 3 Nov 1834. It contained among other proscriptions and orders, the following: "Let the local officers be commanded also to inquire after and seize native vagabonds who open 'opium furnaces,' making diligent search for them, and punishing severely."<sup>74</sup>

What was an opium furnace? In the first decades of Europe in the 19th century a furnace was not simply a means of heating a dwelling. The word had a double meaning as a piece of laboratory equipment. The chemist William Thomas Brande uses the word this way to describe the various furnaces he used, including "a sand furnace," "a wind furnace," "Knight's portable furnace," and "a portable assay-furnace."<sup>75</sup> Many of these were especially designed to aid the process of distillation. The word arrives via the alchemists. One of them, Glauber, famous for his salts and a method still used in

<sup>70</sup> Kuo, p. 233-234.

<sup>71</sup> Kuo, p. 228.

<sup>72</sup> Kuo, p. 215.

<sup>73</sup> Kuo, p. 215.

<sup>74</sup> *CR*, vol. 3, p. 488 (MD).

<sup>75</sup> Brande, William Thomas. *A Manual of Chemistry*. 3rd edition. Vol. I. London: John Murray, 1830, pp. xi-xii (GB).



Brande's period for preparing muriatic (hydrochloric) acid, wrote a book on the subject, entitled Chemical Furnaces.<sup>76</sup> Brande generally disparages them but does extend credit for their "invention of apparatus."<sup>77</sup> He describes the home of one alchemist, whose "rooms, which were extensive, were so filled with furnaces and apparatus that it was difficult to reach the fire-side."<sup>78</sup>

The Chinese wholesale dealers in opium were also known as "brokers." Hew Kew, Sub-censor over the Military Department, notices them: "To purchase wholesale, there are brokers."<sup>79</sup> In the province of "Kwangtung the wholesale dealers in opium [have] established large stores" according to Hwang Tseotsze, President of the Sacrificial Court, in a memorial to the emperor of 1838.<sup>80</sup> Leangchang Ken, Lt. General of the Province of Kwangse wrote in 1838 that the problem "really rests with the opium brokers of Canton, and for these the laws have no forgiveness."<sup>81</sup> He despises them and notes that they not only store it but prepare it (*italics added*):

As to the opium brokers, they have a thousand cunning schemes; let their nests and dens be searched ... [the] nests where the opium brokers store it and *prepare it*. ... [One must] strictly search for and prohibit the resorts of opium brokers. ... To punish the crimes of these opium brokers by death is certainly not too severe ... [and] the opium brokers should be executed immediately an answer is received from the Board of Punishments confirming their sentence.<sup>82</sup>

These brokers were also called "melters." Heu-Naetse, the Vice-President of the Sacrificial Court refers to them in this way in a memorial to the emperor dated June, 1836:

<sup>76</sup> Brande, p. xxxviii (GB).

<sup>77</sup> Brande, p. xxi (GB).

<sup>78</sup> Brande, p. xx (GB).

<sup>79</sup> "Statement of Claims," p. 128 (GB) quoting the Correspondence Relating to China (1840), pp. 173-178.

<sup>80</sup> "Statement of Claims," p. 136 (GB) quoting the Correspondence Relating to China (1840), pp. 271-280.

<sup>81</sup> "Statement of Claims," p. 143 (GB) quoting the *Canton Register*, 23 Oct 1838.

<sup>82</sup> "Statement," pp. 143-144 (GB), quoting the *Canton Register*, 23 Oct 1838.

At Canton there are brokers of the drug, who are called "melters." These pay the price of the drug into the hands of the resident foreigners, who give them orders for the delivery of the opium from the receiving-ships.<sup>83</sup>

Choo Tsun also calls them by this term in a memorial of October 1836:

Hence there are at Canton, in the provincial city, brokers, named "melters." These engage money-changers to arrange the price with the foreigners, and to obtain orders for them; with which orders they proceed to the receiving-ships, and there the vile drug is delivered to them. This part of the transaction is notorious, and the actors in it are easily discovered.<sup>84</sup>

Waley uses this expression when he translates Lin's diary entry for 17 June, the day of the visit of the foreigners (*italics added*): "Today we *melted* 1,600 chests of 'Company' opium."<sup>85</sup> Nor does this seem to be an infelicitous translation because P. C. Kuo also translates both of Lin's memorials to the emperor on his new process using the same word (*italics added*):

Meantime, a number of laborers are hired to stir inside the pond with their plows so that every particle of the drug shall be *melted* away. ... The same process of dissolving, mixing, *melting*, and stirring is followed. ... Therefore we sent officers to escort them to the ponds and let them fully acquaint themselves with the methods of cutting opium, dissolving, *melting*, and destroying it.<sup>86</sup>

Both Waley and Kuo translate what Lin does with the opium as "melting." Clearly, Lin has become a melter of opium.

But the preparatory process in China may have involved more than a simple boiling. Sometimes the process was also termed "refining." Bingham calls it by that name: "The opium, when purchased from the importer, passes through a *refining process*

---

<sup>83</sup> "Statement of Claims," p. 112 (GB) quoting the Correspondence Relating to China (1840), pp. 156-161.

<sup>84</sup> "Statement," p. 115 (GB) quoting Corresp. Rel. to China (1840), pp. 168-173.

<sup>85</sup> Waley, p. 50.

<sup>86</sup> Kuo, pp. 246, 249.

(italics Bingham)."<sup>87</sup> His observations also have an echo over a century and a half later when a film crew from Boston public television does a documentary on Southeast Asian morphine labs (italics added):

At the *refinery*, which may be little more than a rickety laboratory equipped with oil drums and shrouded in a jungle thicket, the opium is mixed with *lime* in boiling water. A precipitate of organic waste sinks to the bottom. On the surface a white band of morphine forms.<sup>88</sup>

The distinction between boiling and purification was also made by Western observers in the 19th century. As noted earlier, Bridgman reviews Murray, Crawford and others' Historical and Descriptive Account of China for his readers and reprints a passage in volume three that Bridgman thinks is written by Crawford (italics added):

The opium, before it is smoked by them, is known to be boiled *and* purified: the result of which process has been ascertained, by a chemical analysis, to be no other than a rude *morphia*.<sup>89</sup>

Bridgman has faint praise for the book, generally, and notes its many errors, though not specifically this one, which he quotes "without comment." The author of the passage in Murray's work does not say explicitly that the Chinese purifiers use either salt or lime in their process of purification.

Bingham also writes that the Chinese add something during their process of refining opium though he can't say what (italics added): " [F]requently [the opium] is mixed with some kind of *conserve*."<sup>90</sup> Bingham's observation of the use of "some kind of

---

<sup>87</sup> Bingham, p. 89 (GB).

<sup>88</sup> "Transforming Opium Poppies into Heroin" found at [www.pbs.org/wgbh/pages/frontline/shows/heroin/transform](http://www.pbs.org/wgbh/pages/frontline/shows/heroin/transform).

<sup>89</sup> Bridgman, *CR*, vol. 6, p. 66 (GB), quoting Murray, 1836, p. 63 (GB). Notice p. 63 conspicuously missing. See Murray, 1843 (GB) for pages 62-63. Notice *CR* vol. 6 (GB) also mis-indexed.

<sup>90</sup> Bingham, p. 89 (GB).

conserve" during the preparatory process has indirect references to the use of both lime and salt, each of which is a traditional method of food preservation. Even so, there are still no direct references from 19th century Western sources that the preparatory process for the opium once in China involved the use of either salt or lime. Lin however says just this in his memorial to the emperor with regard to the purifiers.

Lin now must act on this new knowledge he has received from the opium dealers, wholesalers, brokers, purifiers, preparers, refiners, distillers or melters. He must construct something in which to carry out this mega-melt. He tells the emperor why he chose to dig his large tanks (*italics added*):

But if the numerous chests are to be destroyed thus by salt and lime one by one, then tens of thousands of *pans* should be established; and in that case, a thorough supervision would be most difficult. If a small number of them are established, then it would take several months to complete the work of destruction.<sup>91</sup>

No doubt he had one of the "purifiers" demonstrate this new method for him in practice on a small scale in one of these "pans." References to the use of "pans" occur repeatedly in the article entitled, "The Chinese Method of Preparing Opium for Smoking, Described in a Series of Experiments" that was published in the August 1837 issue of the *Chinese Repository* (*italics added*):

The exsiccation is continued by spreading the mass over the inner surface of the *pans* ... from the edge of which the liquor is poured by inclining the *pans*. ... Requisite Apparatus: Three hemispherical brass *pans* of equal size; two or three bamboo baskets for filters ....<sup>92</sup>

It is Lin who makes the connection between the purifiers with their pans and the use of salt and lime. Not simply the boiling of it in

---

<sup>91</sup> Kuo, pp. 245-246.

<sup>92</sup> "The Chinese Method of Preparing Opium for Smoking, Described in a Series of Experiments," *Chinese Repository*, vol. VI, pp. 197-199 (MD), reprinting an article first published in the *Canton Courier* for 21 Apr 1832.

water, but the addition of "some kind of conserve" perhaps including salt and lime appears to sometimes be a part of this process of preparing a product to be sold in China.

As an aside, there is the oddity of a line in Lin's first memorial to the emperor on his new process (*italics added*):

*We thereupon realize that it must be due to a particular manipulation in the preparation of the drug, different from the ordinary method of deriving it from the poppy as commonly known, that this drug can stupefy men's spirits, shorten their lives, and distort their physical shape.*<sup>93</sup>

What is this extraordinary method to which he refers? Waley thinks this refers to the "many fantastic folk-beliefs about the making of opium:"

'When a man dies', says an anonymous British Museum manuscript of about 1842, 'the people (of the Phillipines) throw him into a huge common gravel-pit and cover him with dead bodies of the serpent-eagle and with poppies. They then wait for several months till the blood and flesh of the man and bird have mixed with the poppies, whereupon they strain off the sediment, boil it and make a paste that they call *ying-hsiu*, which is opium. The English imitated this method and made the poison in order to destroy the Chinese with it.'<sup>94</sup>

But does Lin believe this? In his second letter to the queen, this skilled civil engineer knows where it comes from and the kind of equipment used to prepare it (*italics added*):

It is only in sundry parts of your colonial kingdom of Hindostan, such as Bengal, Madras, Bombay, Patna, Malwa, Benares, Malacca, and other places where the very hills are covered with the opium plant, *where tanks are made for the preparing of the drug ....*<sup>95</sup>

Given his well-documented curiosity, that Lin knows this much suggests he also has enquired after the details of the process used for preparing the opium in these Indian tanks. In fact, the opium

<sup>93</sup> Kuo, pp. 246-247.

<sup>94</sup> Waley, p. 49.

<sup>95</sup> *CR*, vol. 8, pp. 500-501 (MD).

had arrived via India after a simple drying process to reduce its moisture content. There was nothing exotic in this. It was certainly not the foreigners who were engaged in any "particular manipulation in the preparation of the drug, different from the ordinary method ... as commonly known."

### C. DISCUSSION AND QUESTIONS

It is still unclear just how much Lin could have known about the previous four decades of work in the West on alkaloid extraction from opium or about the particulars of the various European methods, especially those using salt and lime.

News of these scientific developments appeared in both Slade's *Canton Register* and Bridgman's *Chinese Repository*. The unknown "Chinese artist" experiments with opium in Canton and obtains crystals that he calls salt of opium as early as 1832; his experiments were published in the *Canton Courier* and reprinted in the *Chinese Repository*. An imperial decree forbidding the opening of "opium furnaces" dates to at least 1834. Waley says Lin translated excerpts from Murray's Encyclopedia of Geography and Bridgman published an excerpt in 1837 from Murray's Historical and Descriptive Account of China discussing the idea of introducing the Chinese to morphine. An article describing how to prepare another opium alkaloid, narcotine, appeared in the 1838 *Canton Register*, originally published in *The India Gazette* the same year.

Even from this small sample, it appears that the knowledge of these new alkaloids was available and was widely reported. Recipes were published, the traders and missionaries at Canton probably knew of it, and Lin was curious enough to order translations from various English books as well as periodicals published at Canton, Macao, Singapore and India. Against this, Waley says Lin did not begin his efforts at translation "probably" before he completed his processing of the foreigner's opium. Chang writes that Lin's interest in the West predates this by at least a decade but when he began his translations is not known. Though Lin inquires about law and geography and much else in the West, there has been no specific evidence presented that he ever inquires of Westerners as to how to

extract the alkaloids from opium, or how to purify it or distill it. This questions whether Lin needed to obtain this knowledge from the Europeans.

To definitively show a written Western source for Lin's method of salt and lime means looking for evidence of a particular Western book or periodical translated for Lin sometime prior to June 1839 that contained a recipe for extracting the alkaloids of opium similar to his own. After that there would need to be a reference by Lin on some page of the book or in some dispatch or diary entry that he had read that particular passage. Alternatively, the source could be oral, some Western missionary or trader who knew of the Western developments and communicated them directly to Lin. But a reasonable standard of proof would still require some diary entry, for example, that such communications had been made. There may indeed exist such evidence. One could just as well ask why Lin wouldn't have known about these Western experiments since he appears to have written extensively on all aspects of the subject of opium in his memorials to the emperor of 1838 and because he shows himself so curious about the West and to be so much better informed than many of his fellow mandarins.

To ask for a European source of information for Lin's method of salt and lime inevitably raises the caution of just how much this is motivated by the influence of a certain Western chauvinism, a belief in the advances of European science as the only available source of this knowledge. Derosne, Séguin and Sertuerner are not discovering anything new when they extract morphine, narcotine and meconic acid from opium. What is new is not the extraction of alkaloids from opium but their isolation. Further, this isolation is relative. There is a serious question as to just what degree of isolation they are initially achieving as the earliest European morphine, for example, was probably still mixed with not insignificant traces of the other alkaloids.<sup>96</sup> The Western medical model of isolating active principles can be seen from another perspective as more of a belief and a philosophy, one that presupposes there is great merit in the analysis

---

<sup>96</sup> See Appendix D-Chemistry for a discussion of the description and determination of the exact formula for morphine.

itself, in the cutting-up of a plant with a pair of chemical scissors into its respective chemical parts. How much this is driven by potential sales, marketing and patents should never be ignored. The proof is in the patient and in Europe morphine initially had difficulty competing with common preparations of opium among the general public.

The Eastern sources of Lin's knowledge for alkaloid extraction are exact as stated by Lin: he learned this new process from the purifiers. It appears there is a nexus between the references to the Chinese dealers, distillers, purifiers, etc., of opium. Explicitly Lin says they know the effects of using salt and lime in this process; as well there are the hints from Bingham's use of the word "conserve" and Murray's reference to the local Chinese production of a "rude morphia." Further, Barbier's experience with burned opium soluble in a lime solution and the Chinese purifiers' ability to recover "twenty or thirty percent" from burned opium together with their admitted experience using lime and salt and opium suggest a similar process. It must be cautioned again that this explanation is Kuo's and does not occur in the original. Bridgman's article mentioning "regular crystals of the salt of opium" prepared by a "Chinese artist" may refer to narcotine or to morphine or to some product contaminated with both. It is deliberately speculative and these clues establish nothing definite, but there is the suggestion that the Chinese purifiers may have had the ability to extract the useful alkaloids from opium using lime and salt, perhaps even manufacturing an effective morphine base at least as early as 1832. This would coincide roughly with a need to conceal the opium in some manner, perhaps by changing its form, due to the Chinese crackdown on domestic opium around the beginning of the 1830s. That illegal substances often become concentrated or distilled during prohibitions is well demonstrated.

But whoever they are and whatever the details of the process, these "purifiers" or "distillers" are not trying to destroy opium, they are trying to purify it, distill it, and so prepare a product ready for the Chinese market. A number of questions can then be raised about Lin's explanation to the emperor. Why are these purifiers using salt and lime if this will not "yield the oily paste desired"? Is



it the oily paste that is desired? Or is it the alkaloids? Why are "purifiers" so conversant with this practice of "destroying" opium with salt and lime, since this is clearly not their task? In fact, it is the opposite. If the purifiers are using water, lime and salt, more and more this does not appear to be a process of destruction but one of purification, distillation, and preparation of a product to be sold locally. At the very least, the use of the word "destroy" in this context is somewhat disingenuous.

Did the purifiers learn their chemistry from Europeans? But this just pushes the game back one step. Instead of searching for written Western sources that Lin studied, it would be necessary to search through the reading lists of a multiplicity of anonymous Chinese brokers and chemists. Those who deeply desire to find a Western source can take some comfort in the close relations between the Chinese brokers and the Western opium traders. Leangchang Ken, who expends so much venom on the brokers, says that "for years they have been intimately acquainted with the foreigners; the greatest confidence exists between the two parties; one word nails their bargains, opium chits fly from one to the other, and the brokers have not the least fear of being deceived or cheated."<sup>97</sup>

It should not be forgotten in this very speculative search for sources that lime and salt are two traditional methods of food preservation and food preparation, and lime has been used to extract alkaloids from various medicinal plants by different cultures around the globe for millenia. The techniques are ancient and predate written history, as briefly discussed in chapter nineteen. Like many other groups, the Chinese may have been able to extract but not isolate the alkaloids from opium using lime many hundreds, if not more than a thousand years earlier than European chemists. With all of this much older knowledge available, one has the right to ask from where the European chemists and pharmacists of the early 19th century are deriving their knowledge of alkaloid extraction and is it possible that they obtained these ideas from the East.

---

<sup>97</sup> "Statement," p. 143 (GB), quoting the *Canton Register*, 23 Oct 1838.

## XXI THE INGREDIENTS

---

- XXI. THE INGREDIENTS
- A. SALT
  - B. LIME
  - C. SEAWATER AND LIME
  - D. SALT, WATER AND LIME
  - E. OPIUM
  - F. DISCUSSION

ANY number of 19th century European chemists experimented with the same limited set of opium, solvents, acids, bases and salts. Séguin, Sertuerner, Merck, Morson, Thibouméry and Mohr, Gregory and Robinson all experimented with some compound of calcium, various salts and opium. Especially Robinet, Pelletier and Guibourt, Robiquet, and Henry experimented with precipitations of morphine with both salt brines and lime. Lin's basic ingredients are also salt, lime, opium and water. But within this small set of ingredients there are many possible variations and combinations.

### A. SALT

Both Bridgman and Lin say only that "salt" was used without further description. King doesn't notice it in his narrative. Slade translates Lin's proclamation of around 31 May as meaning "rock salt" but he is alone in this, though sometimes the term is used to mean common salt. Lin writes to the emperor that he uses not salt but a "bittern" or salt brine, *yan2 lu3*.<sup>1</sup> There are many kinds of salt and many things that resemble salt; Bridgman does not record that

---

<sup>1</sup> CBYWSM (TK), vol. 7, page 7a, line 10.

he tested the salt, by taste for example. So it must be assumed that both the barbarian Bridgman and the mandarin Lin are referring to the salt they would have been familiar with, common salt.

But common salt in the 19th century was rarely chemically pure sodium chloride (NaCl). The exact composition of the salt depended upon where and how it was produced. Salt was manufactured in the 19th century in a variety of ways including rope houses,<sup>2</sup> thorn walls,<sup>3</sup> shaft mining, freezing,<sup>4</sup> solution mining, and solar evaporation in salt ponds. The last two are particularly interesting.

Solution mining in the 20th century used drilling and pumping and shallow open pans to evaporate the brine. The salt pans for "solution mined brine will be found near to the brine shaft. In this case extra heat is often provided by lighting fires underneath."<sup>5</sup> According to Tomlinson (1850), in the 19th century the Chinese of Szu-Tchhouan province bored holes 1500 feet deep and used the accompanying inflammable gas to heat large, shallow cast iron cisterns to evaporate the brine solution; instead of pumps long, hollow, valved bamboo tubes were lowered down into the well and winched up again with oxen.<sup>6</sup>

In the process of solar evaporation, man-made ponds called salt pans, or salt evaporation ponds, are excavated near the seacoast. "The seawater is fed into large ponds and water is drawn out through natural evaporation which allows the salt to be subsequently harvested."<sup>7</sup> Solar evaporation is "the oldest and least used in the United States" but still accounted "for fifty percent of the world's production"<sup>8</sup> in the late 20th century.

---

<sup>2</sup> Tomlinson, Charles. The Natural History of Common Salt. London: Society for Promoting Christian Knowledge, 1850, p. 150 (GB).

<sup>3</sup> Sproule, John, editor. The Irish Industrial Exhibition of 1853. Dublin: James McGlashan, 1854, p. 77 (GB); Tomlinson (1850), p. 140 (GB).

<sup>4</sup> Tomlinson (1850), p. 278 (GB).

<sup>5</sup> Found at <http://en.wikipedia.org>.

<sup>6</sup> Tomlinson (1850), pp. 178-182 (GB).

<sup>7</sup> Also found at wikipedia.

<sup>8</sup> Fine, Leonard W. Chemistry. 2nd ed. Baltimore, MD: William and Wilkins, 1978, p. 381.

Sea water normally contains only a few percent of sodium chloride in solution. The salt will crystallize if enough water is evaporated. This happens naturally in some inland salt lakes:

In the steppes of Asiatic Russia lakes of salt-water are numerous. Their waters hold so large a quantity of salt in solution, that the action of the summer heat is sufficient to convert it into crystals, which, carried to the banks by the action of the waves, form there immense shoals of salt. ... [T]he action of sun produces in them, during the summer season, crystals of salt so numerous, that by mutual contact they at length form thick and solid arches, which like winter ice cover the surface of the lakes. These masses are frequently nine inches thick ... horses, chariots and camels pass safely over them.<sup>9</sup>

In order to encourage this crystallization to take place at the seacoast, salt ponds or pans were often constructed not individually but in a series of cascading tanks. John Sproule (1854) describes the technology of coastal salt making in southern Europe using a number of interconnected pools to help it crystallize (*italics added*):

[G]reat quantities of excellent salt are produced by the evaporation effected by the sun in large ponds called *salt-gardens* .... These gardens are simply a number of shallow ponds, laid out on a stiff clay soil, on the coast, and protected from the action of the tides. The principle upon which they are constructed is, to expose the greatest possible surface to the action of the sun. *The first pond*, which is usually about five feet deep, has a sluice, by means of which it can be filled from the sea. *Here the water is allowed to deposit its mud and become clear.* From this pond *it passes by means of a pipe into a second pool*, much smaller and shallower ... before it escapes out the opposite angle into a third pond .... From the third pond it passes into the fourth, where it begins to *crystallize*. The salt, as fast as it forms, is collected with rakes into small heaps on the narrow dykes which separate the ponds.<sup>10</sup>

Huskiisson (1853) describes a similar system of interconnected ponds being used in coastal France (*italics added*):

---

<sup>9</sup> Tomlinson (1850), p. 240 (GB).

<sup>10</sup> Sproule, John, editor. The Irish Industrial Exhibition of 1853. Dublin: James McGlashan, 1854, p. 77 (GB). *Italics Sproule*.

The process adopted in warm countries is solar or natural evaporation, under the form of "saline tanks," "brine reservoirs," or "salt marshes," also called "brine pits." The French salt marshes are large shallow basins or pans, excavated along the sea-shore; they are formed of clay, and the bottoms are very smooth. The water is admitted from the sea into a reservoir by means of a sluice ... where, while it is exposed, surface evaporation goes on to a great extent, and mechanical impurities subside. It then *passes by a subterranean passage into a series of brine pits*, properly so called, divided by means of little banks; *channels of communication are pierced through these banks* from one pit to another, so contrived that the brine has a very circuitous route, sometimes passing through three sets, and flowing 400 or 500 yards .... During the whole of this time the brine has been undergoing evaporation; and when it arrives at the last division, it is so far concentrated that *crystallization is soon effected*.<sup>11</sup>

Tomlinson (1850) also depicts a similar series of cascaded salt ponds connected with channels and provided a diagram (*italics added*):

This operation is carried on in what are called *salt gardens* or *salterns*, which are laid out upon a clay soil, on the sea-coast; they are secured from the influence of the tides, and are worked during the summer months from about March to September. The collecting pond A is filled at the flow of the tide through a flood-gate to the height of from two to six feet. Here the evaporation begins, but *the principal object of this first pond is to allow the water to deposit its mud*. The clear water is then *conveyed by means of a pipe from the collecting pond to the first series of pools BB*, which are quite horizontal but very shallow. From these, *by means of a channel* which passes entirely round the remaining pools, and in the saltern from which the diagram is taken this channel is 16,000 feet long; from this it enters at D into the ponds EE, from thence into F, and lastly, runs through the open channel hh to a third series of ponds GG, each channel h conducting it into four of the ponds GG. Here the evaporation has proceeded so far that the *salts begin to crystallize* in the hindermost of these reservoirs, of which there are four rows. The manner in which the water arrives in these through the gutters in the sides, is shown in the diagram. A crust of salt gradually forms on the surface

---

<sup>11</sup> Huskisson, H. Owen. "Salt - The Sources from Whence it is Obtained, and the Processes Involved in its Manufacture," *Journal of the Society of Arts*, vol. 1. London: George Bell, 1853, p. 426 (GB).

G, and this is broken up and collected with rakes into small heaps *ii* on the sides, and from these the mother liquor runs off into the ponds G.<sup>12</sup>

Sir Stamford Raffles noticed just such a system of cascaded ponds used in the manufacture of salt in Java (*italics added*): "The salt-water is admitted through a *succession of shallow square compartments*, in each of which it receives a certain degree of concentration, until arriving at the last, the water is completely evaporated, and the salt left behind *fit for immediate use*."<sup>13</sup> On the latter supposition, Raffles may have been incorrect.

In the China of the early 19th century, both the boiling of salt brine and evaporative salt pans were described by foreign visitors. On his second voyage, on board the British East India Company *Lord Amherst*, the missionary-translator-adventurer Karl Frederich Gutzlaff spied salt works at Kea-tsze which used both salt pans and a secondary boiling and he added a political note (*italics added*):

The next day (10 March 1832), which was very fair, we made an excursion to the right of Kea-tsze. Here are extensive saline works, consisting of *an elevated bed of mud, where the sea water is partially evaporated. After this it is boiled till the pure salt appears*. The monopoly of salt is one of the most important revenues of the Celestial Empire. The merchants who deal in it are generally the richest individuals in the country. Yet the monopoly, though under the conduct of certain officers, is generally so conducted as to become very oppressive to the poor, and a heavy national burden.<sup>14</sup>

First Lt. J. Elliot Bingham, on board the *Modeste* in 1840, made a side trip to explore Elephant's Trunk Island on 29 July, recording what he called the Chinese method of salt-making, using a combination of coastal salt pans and extra heat (*italics added*):

---

<sup>12</sup> Tomlinson, Charles. *The Natural History of Common Salt: Its Manufacture, Appearance, Uses and Dangers, in Various Parts of the World*. London: Society for Promoting Christian Knowledge, 1850, pp. 260-261 (GB), *italics* Tomlinson.

<sup>13</sup> Tomlinson (1850), pp. 271-272 (GB).

<sup>14</sup> Gutzlaff (1834), pp. 159-160 (GB); for the problems of salt merchants during this period, see Appendix A-Silver, Salt and Opium.

Much salt was made by the villagers; and as well as I could understand from the want of oral communication, the following was their process. Over their salt pans is spread a sandy earth, upon which they pour in an abundance of water from the sea, and when it is entirely saturated therewith, and the *water has been evaporated by the rays of the sun*, this dried earth is chipped off to about one inch in depth. This is then *trodden into vats*, built of clay for the purpose, about seven feet long and four feet broad, having a *sieve-like bottom formed of canes*; sea-water is then poured on the top, and allowed to filter through this earth and cane-work into a reservoir beneath, from which a small gutter formed of half a bamboo, leads it into large round pans. Some of this liquid I tasted, and found it to be a *very strong brine, which they were boiling down* at the adjoining village in glazed earthen pans, placed in a row, with fires under each pan. It reminds me much of the interior of a boiling-house on a sugar estate in the West Indies.<sup>15</sup>

Fuel is expensive. Instead of boiling the recovered sea water brine, the Chinese also used the slower and more economical method of simple solar evaporation. In September 1831 on his first voyage aboard the Chinese junk *Shunle* which was being towed by thirty "thinly clothed" men up the Pei-ho river, Gutzlaff observed salt-making using only salt pans and a secondary storage (*italics added*):

[T]he large and numerous stacks of salt along the river, especially at Teen-tsin, ... cannot fail to arrest the attention of strangers. The quantity is very great, and seems sufficient to supply the whole empire; it has been accumulating during the reign of five emperors; and it still continues to accumulate. *This salt is formed in vats near the sea shore*; from thence it is transported to the neighborhood of Ta-koo, where *it is compactly piled up on hillocks of mud, and covered with bamboo mattings*; in this situation it remains for some time, when it is finally put into bags and carried to Teen-tsin, and kept for a great number of years, before it can be sold. *More than eight hundred boats* are constantly employed in transporting this article; and thousands of persons gain a livelihood by it, some of whom become very rich: the principal salt merchants, it is said, are the richest persons in the empire.<sup>16</sup>

<sup>15</sup> Bingham, vol. I, pp. 196-197 (GB).

<sup>16</sup> Gutzlaff (1834), pp. 119-120 (GB).

Huskisson (1853) observes a similar storage process being used in France which he says is for the purpose of draining and drying the salt (*italics added*):

It [the salt] is then withdrawn from the pans, and collected upon the borders in *conical or pyramidal heaps, called "camelles," where it drains and dries.* The salt thus obtained is called "bay salt," and partakes of the colour of the bottom upon which it is formed.<sup>17</sup>

But what Gutzlaff and Huskisson are observing (and why Raffles was probably wrong) is not simply a drying process. The reason for piling up, covering and storing the salt for long periods is to rid the salt of its impurities. Sea salt is often contaminated with magnesium chloride, calcium chloride, sodium sulfate, magnesium sulfate, calcium sulfate and other trace elements. The magnesium chloride in particular caused salt makers a major problem (*italics added*):

Of all these salts, the *chloride of magnesium has the greatest influence on the quality of the produce, on account of its deliquescence* in the air and its highly saline taste. Pure chloride of sodium never attracts moisture from the air; but, when containing only a minute portion of chloride of magnesium, *it soon becomes wet in damp weather.*<sup>18</sup>

Sproule (1854) provides an explanation similar to that of Tomlinson and a depiction similar to that of Gutzlaff but drawn from the salt ponds of Europe (*italics added*):

The salt as it is first raked out of the ponds and made into heaps is very impure, *the principal foreign substance being chloride of magnesium*, a compound analogous to salt, the soda of the latter being replaced by magnesia. *This substance is very deliquescent*, that is, it imbibes water from the atmosphere and becomes liquid. *It is this impurity which causes salt to become damp in the winter.* To get rid of this and other foreign matters, the

---

<sup>17</sup> Huskisson, H. Owen. "Salt - The Sources from Whence it is Obtained, and the Processes Involved in its Manufacture," *Journal of the Society of Arts*, vol. 1. London: George Bell, 1853, p. 426 (GB).

<sup>18</sup> Tomlinson (1850), p. 161 (GB).



salt, after it has sufficiently drained from the mother liquors on the dykes, is *piled into great heaps, and thatched with dry grass*, and is thus protected from the rain; but the moisture of the atmosphere gradually liquefies the chloride of magnesia, which, in draining away, washes the greater part of the impurities with it.<sup>19</sup>

Unless there were nearby salt mines or brine wells and because of the proximity of Canton to the sea, Lin's salt (and Bridgman's) would more than likely have been sea salt with many of the impurities, including the magnesium chloride removed. As will be seen shortly, there is another method for ridding salt water of its magnesium chloride.

#### B. LIME

The word *lime* means many things to many writers. Chung says "lime powder"<sup>20</sup> while Collis, Bridgman, Fay, and Chang all write simply "lime."<sup>21</sup> Waley does not address the issue. Callery and Yuan and Slade think "quick-lime" or "unslaked" lime was used and Train and Bingham agree.<sup>22</sup> King doesn't notice either salt or lime. Kuo translates Lin's Chinese as "whole pieces of thoroughly heated limes."<sup>23</sup> The original online agrees, using *shi2 hui1* or lime, generally thought of as quicklime, that has been thoroughly roasted, using *shao1 tou4* or "burn, bake or roast" and "penetrate, thorough."<sup>24</sup> Though the DEA's anonymous observer in Southeast Asia says any of the three will work, with such a diversity of opinion it could be useful to carefully distinguish between limestone, quicklime and slaked lime.

---

<sup>19</sup> Sproule, John, editor. The Irish Industrial Exhibition of 1853. Dublin: James McGlashan, 1854, p. 77 (GB).

<sup>20</sup> Chung, p. 199.

<sup>21</sup> Collis, p. 231; Bridgman, *CR*, vol. 8, p. 74; Fay, p. 160; Chang, p. 174.

<sup>22</sup> Callery and Yuan, p. 17; Train, p. 90 (GB); Bingham, p. 87(GB); Slade (1839), p.p. 109-110.

<sup>23</sup> Kuo, p. 246.

<sup>24</sup> CBYWSM (TK), vol. 7, page 7b, line 9.

Limestone, marble, coral, sea shells and chalk are mainly calcium carbonate ( $\text{CaCO}_3$ ).<sup>25</sup> Calcium carbonate is easily attacked by the acids present in the atmosphere and in rain, readily seen, for example, in the gargoyles of the cathedral of Notre Dame.<sup>26</sup> The same slightly acid rain dissolves limestone under the ground and "slowly forms stalagmites over thousands of years."<sup>27</sup>

When limestone (calcium carbonate) is heated "at about 1000 degrees centigrade, it undergoes thermal decomposition, loses carbon dioxide and turns into *quicklime* (calcium oxide,  $\text{CaO}$ )."<sup>28</sup> Chemically, the reaction looks like:  $\text{CaCO}_3$  decomposes with heat into  $\text{CaO} + \text{CO}_2$ .<sup>29</sup> The burning of limestone to produce quicklime is evidently very old:

The production of calcium oxide from limestone is one of the oldest chemical transformations produced by man. Its use predates recorded history. Most ancient languages have a word for calcium oxide. In Latin, it is *calx*. In Old English, its name is *lim*.<sup>30</sup>

In the 21st century, calcium oxide (quicklime) is manufactured in "specially constructed lime kilns (high temperature ovens). Limestone is added at the top, and quicklime is removed from the

---

<sup>25</sup> Clark, Ronald D. and Robert L. S. Amai. *Chemistry: The Science and the Scene*. Santa Barbara, CA: Hamilton Publishing Company, 1975, p. 258; [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm); [www.answers.com](http://www.answers.com); <http://scifun.chem.wisc.edu/chemweek/lime/lime.html>,

<sup>26</sup> Burns, Ralph A. *Fundamentos de Química*. 2nd ed. Translated by Hector Javier Escalona y Garcia. Naucalpan de Juarez, Mexico: Prentice Hall Hispanoamericana, S. A., 1996, p. 480.

<sup>27</sup> Phillips, John S. et al. *Química: Conceptos y Aplicaciones*. Trans. Maria del Carmen Ramirez Medeles and Rosa Zugazagoitia Herranz. Mexico, D.F.: McGraw Hill, 2000, p. 524. Originally, *El  $\text{CaCO}_3$  se precipita lentamente forma estalagmitas durante miles de años*.

<sup>28</sup> Found at [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm); Phillips, pp. 157, 211; Chang, Raymond. *Química*. 6th edition. Mexico, D.F.: McGraw Hill, 1999, p. 740.

<sup>29</sup> Found at [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm); Phillips, pp. 157, 211; Chang, Raymond, p. 740.

<sup>30</sup> Found at <http://scifun.chem.wisc.edu/chemweek/lime/lime.html>.

bottom in a continuous process."<sup>31</sup> In 1842, Kane offered a more elaborate description of the same process:

On the large scale, lime is obtained by burning the ordinary limestone in kilns. At the bottom is a grate on which fuel is laid, and the kiln then filled with limestone and fuel, (culm or small coal) mixed in suitable proportions; when the fire is lighted on the grate, the combustion extends throughout the mass, and as the perfectly burned lime is extracted at the bottom by the orifice of the grate, new quantities of fuel and limestone are introduced above, so that the combustion is continuous; the carbonic acid is completely removed by the rapid draught through the fire.<sup>32</sup>

A similar process was used in 19th century China but with oyster or clam shells obtained from dredging shellfish beds:

For burning it is necessary first to mix together the ground shells and ground charcoal. Then this mixture is spread out carefully in thin layers on top of a layer of dried grass which covers the floor of the kiln. The floor of the kiln has a network of holes, to facilitate the passage of air. Firing begins with setting fire to the dried grass, on the floor of the kiln ... (and air is forced) into the bottom of the kiln ... by using bellows worked by man power. In this fierce draught the fire lit in the dried grass spreads to the mixed together shells and charcoal ... (and) moves on to the next layer, and so, layer by layer, to the top of the kiln.<sup>33</sup>

Perhaps the reason for the antiquity of the process is that quicklime is so useful. Mixed with water and sand, it makes mortar. Mixed with sand and sodium carbonate, the result is glass. "The production of glass from lime is another of the ancient uses of lime."<sup>34</sup> One of the byproducts of the process of burning limestone into quicklime is the release of carbon dioxide. The latter is used in the manufacture of iron from hematite (iron ore, or  $\text{Fe}_2\text{O}_3$ ):

---

<sup>31</sup> Found at [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm).

<sup>32</sup> Kane (1842), p. 565 (GB).

<sup>33</sup> Wong, Tak-yan. "Lime-making on TsingYi," from <http://sunzi1.lib.hku.hk/hkjo/view/44/4401562.pdf>, p. 297.

<sup>34</sup> Found at <http://scifun.chem.wisc.edu/chemweek/lime/lime.html>.

Calcium carbonate ( $\text{CaCO}_3$ ) which is mixed in with the iron ore ( $\text{Fe}_2\text{O}_3$ ) in a coal oven decomposes to form quicklime ( $\text{CaO}$ ) and more carbon dioxide ( $\text{CO}_2$ ). Afterwards, the carbon dioxide oxidizes the coke through a reduction reaction to form carbon monoxide, that is then used to reduce the iron ore to metallic iron.<sup>35</sup>

When quicklime is added to soil, it reduces the acidity, making it more favorable for the cultivation of many kinds of plants.<sup>36</sup> Quicklime (calcium oxide,  $\text{CaO}$ ) is "used in the fabrication of steel, in the production of metallic calcium, in the paper industry, in the treatment of water and in the control of contamination."<sup>37</sup> It is also an ingredient in the Dow process for manufacturing magnesium ingots as will be seen shortly.<sup>38</sup>

By common usage, the same word "lime" is used to denote both quicklime (calcium oxide or  $\text{CaO}$ ) as well as *slaked lime* or hydrated lime, calcium hydroxide,  $\text{Ca}(\text{OH})_2$ . Slaked lime is produced when quicklime is added to water. Chemically the reaction is written,  $\text{CaO}$  is added to  $\text{H}_2\text{O}$  to produce  $\text{Ca}(\text{OH})_2$ , a process known as *slaking*: "[t]he reaction is highly exothermic," meaning it produces a great deal of heat.<sup>39</sup> A more dramatic depiction of the process survives from the first part of the 19th century (*italics added*):

---

<sup>35</sup> Phillips, p. 567. Originally, *La piedra caliza  $\text{CaCO}_3$  que se mezcla con el mineral del hierro en el horno (coal) se descompone para formar cal ( $\text{CaO}$ ) y mas dióxido de carbono. Después, el dióxido de carbono oxida el coque, mediante una reacción redox, para formar monóxido de carbono, que se usa para reducir el mineral del hierro hasta hierro metálico.*

<sup>36</sup> Phillips, p. 494; Chang, Raymond, p. 822; Wong, Tak-yan, p. 295.

<sup>37</sup> Chang, Raymond, p. 740. Originally, *El óxido de calcio ( $\text{CaO}$ ) o cal viva, es una sustancia inorgánica muy importante que se utiliza en la fabricación del acero, en la producción de calcio metálico, en la industria de papel, en el tratamiento de agua y en el control de la contaminación.*

<sup>38</sup> Fine, Leonard W. Chemistry. 2nd ed. Baltimore, MD: Williams and Wilkins, 1978, pp. 366, 382.

<sup>39</sup> Found at [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm);

<http://scifun.chem.wisc.edu/chemweek/lime/lime.html>; [www.answers.com](http://www.answers.com); Chang, Raymond, p. 822; Phillips, p. 494; Fine, p. 366; Burns, p. 310.

Lime is a pure white earth. When exposed to the air it rapidly absorbs water, and falls into a white powder, (slaked lime,) which is a hydrate  $\text{CaO} \cdot \text{HO}$ . If a little water be poured on a piece of well burned lime it is absorbed instantly, and the lime appears quite dry, but after a few moments cracks, and falls into the powder of hydrate, evolving so much heat as to char wood, and inflame gunpowder, when in large quantities. It is thus that *vessels laden with lime have been burned at sea*, by water penetrating the hold.<sup>40</sup>

This is one of several curiosities about Bridgman's narrative: he does not notice this boiling when Lin's "whole pieces of thoroughly heated limes" are added to the opium soaking in the salt brine. "It instantly boils," writes Lin to the emperor, "burning by itself."<sup>41</sup> Another accompanying oddity, also mentioned earlier in chapter eleven, is that both Lin and Bridgman record workmen *in* the tank stirring the mixture of salt and lime. Lin writes that the "labourers hired frequently wear only short trousers, with nothing on the breast or on the feet."<sup>42</sup> But if the workmen are standing inside the tank when the hot lime is added, they will surely be wondering if what they are getting paid is really worth it:

Lime can cause irritation and burns to unprotected skin, especially in the presence of moisture. Prolonged contact with unprotected skin should be avoided. Protective gloves and clothing that fully covers arms and legs are recommended. Particular care should be exercised with quicklime because its reaction to moisture generates heat capable of causing thermal burns. ... Care should be taken to avoid accidental mixing of quicklime and water (in any form, including chemicals containing water of hydration) to avoid creating excessive heat. Heat released by this reaction can ignite combustible materials or cause thermal damage to property or persons. ... Lime dust is irritating if inhaled.<sup>43</sup>

---

<sup>40</sup> Kane (1842), p. 565 (GB).

<sup>41</sup> Kuo, p. 246.

<sup>42</sup> Kuo, p. 246.

<sup>43</sup> "Lime-Treated Soil Construction Manual - Lime Stabilization and Lime Modification," National Lime Association, Bulletin 326. 11th edition. January 2004, page 29. Originally written by the American Road Builders Association Subcommittee on Lime Stabilization, ARBA Technical Bulletin 243, 1959. Found at [www.lime.org/Construct104.pdf](http://www.lime.org/Construct104.pdf).

According to the original online, Lin definitely is using "thoroughly heated limes."<sup>44</sup> This brings up the image of a kiln fired with dried grass and charcoal burning local shell. Bingham, on his tour of Chusan island, noticed that "[l]ime appeared scarce, and what little they have is made from shells of the ostrea tribe."<sup>45</sup> Thoroughly heated, this shell would have been broken down into a roughly-ground type of quicklime, or *cal viva*. Further evidence comes from Kuo's translation of Lin's first memorial to the emperor on the subject where he observes that when he added these "limes" to his mixture, "[i]t instantly boils, burning by itself."<sup>46</sup> This release of a large amount of heat suggests Lin is using some kind of quicklime (calcium oxide,  $\text{CaO}$ ), not slaked lime (calcium hydroxide,  $\text{Ca(OH)}_2$ ). Of course, once the quicklime is thrown into the vat, it combines with the water to form slaked lime. So Lin is slaking lime as a part of his distinctive processing of the foreign opium, turning calcium oxide into calcium hydroxide. Against this, the careful reporter Bridgman does not notice this boiling: either he does not see the lime being spread, does not think this dramatic boiling worth recording for his readers, or his lime is not quicklime but slaked lime (calcium hydroxide),

In the 21st century, the soft, white powder calcium hydroxide ( $\text{Ca(OH)}_2$ ) is used "in leather tanning to remove hair from hides ... (as) a flocculent, in water and sewage treatment" as well as "in making mortar, cements, calcium salts, paints, hard rubber products, and petrochemicals."<sup>47</sup> In the making of cement, the slaked lime reacts with carbon dioxide in the air to produce a mortar that hardens quickly. The reaction is written chemically as  $\text{Ca(OH)}_2$  with  $\text{CO}_2$  becomes  $\text{CaCO}_3$  and  $\text{H}_2\text{O}$ , or slaked lime with carbon dioxide hardens to form limestone and water.<sup>48</sup>

As an aside, the last step in this circular chemical process of limestone to quicklime to slaked lime to limestone shows up in the

<sup>44</sup> *Shao1 tou4 shi2 hui1*, line 9, page 7b, volume7, CBYWSM (TK).

<sup>45</sup> Bingham, p. 349 (GB).

<sup>46</sup> Kuo, p. 246.

<sup>47</sup> Found at [www.answers.com](http://www.answers.com).

<sup>48</sup> From <http://scifun.chem.wisc.edu/chemistry/lime/lime.html>; Chang, Raymond, p. 201.

mystery of what happened to the Biosphere II. This was a man-made, miniature world on three acres, with its own forest, savanna, swamp, desert and working farm that was designed to be self-sufficient. In 1991, four men and four women entered the completely covered structure, intending to remain for two to three years. Very quickly, however, sensors inside the sealed bubble began to indicate a significant drop in oxygen and an increase in carbon dioxide:

By January of 1993 ... the concentration of oxygen had fallen to fourteen percent [from a beginning at twenty-one percent] equivalent to the concentration of oxygen in air at an altitude of 14,300 feet (4,360 meters).<sup>49</sup>

Why did the oxygen fall? Microorganisms in the highly composted soil sucked it up. But this metabolism also produces carbon dioxide, which should have been measured at ten times what it was.

What happened to the missing carbon dioxide? It was slowly eaten by the concrete in the interior of the structure:

The carbon dioxide filtered into the porous structure of the concrete and then reacted with the calcium hydroxide to form calcium carbonate and water. ... In fact, in only two years, the calcium carbonate had accumulated to the depth of more than two centimeters on the concrete of the Biosphere 2. Some 10,000 square meters of exposed concrete had hidden a quantity of 500,000 to 1,500,000 moles of CO<sub>2</sub>.<sup>50</sup>

---

<sup>49</sup> Chang, Raymond, p. 200. Originally, *Por enero de 1993 ... la concentracion de oxigeno habia caido a 14%, equivalente a la concentracion de O<sub>2</sub> en el aire a una altitud de 4,360 m (14,300 ft).*

<sup>50</sup> Chang, Raymond, p. 201. Originally, *El CO<sub>2</sub> se filtra en la estructura porosa del concreto, entonces reacciona con el hidroxido de calcio para formar carbonato de calcio y agua. ... De hecho, en solo dos años, el CaCO<sub>3</sub> se habia acumulado a una profundidad de mas de 2 cm en el concreto de la Biosphere 2. Unos 10,000 m<sup>2</sup> de concreto expuesto habían ocultado una cantidad de 500,000 a 1,500,000 moles de CO<sub>2</sub>.*

## C. SEAWATER AND LIME

The Dow process for producing magnesium ingots in the 20th century depended upon the reaction between seawater and lime (*italics added*):

It begins with sea water, pumped directly into large settling tanks at plants located on the ocean (North Carolina and Texas) where it is mixed with *calcium oxide (CaO, lime) obtained by roasting oyster shells (CaCO<sub>3</sub>)*. An insoluble precipitate of milk of magnesia (magnesium hydroxide) is left which settles to the bottom of the tanks where the slurry is drawn off and filtered.<sup>51</sup>

Lime added to sea water will precipitate the magnesium into the sediment. But this was known about long before Dow assumed the name.

Saltmakers used this process in the 19th century as an alternative, faster method of eliminating the magnesium chloride from sea salt so as to prevent deliquescence. Instead of covering and storing the salt for long periods of time they added lime to the brine solution: "The chloride of magnesium can be got rid of during the soccage by adding slacked lime to the brine in the pan."<sup>52</sup> Huskisson (1853) describes the problem and the solution when extra heat is being used (*italics added*):

Chloride of sodium, from its tendency to crystallize in hot liquors which retain other salts in solution ... can easily be taken out, as it forms, with a scoop, from those that remain, with the exception of *chloride of magnesium*, which adheres to, and between the interstices of the crystals of common salt (and which) *renders the salt deliquescent*, and when in large quantities, *causes it to taste bitter*. ... Dr. Ure proposes to get rid of it by *mixing quicklime in equivalent quantity to the magnesia present*, which will precipitate this earth and form chloride of calcium, which will immediately re-act upon the sulphate of soda present, with the production of sulphate of lime and chloride

---

<sup>51</sup> Fine, p. 382.

<sup>52</sup> Tomlinson (1850), p. 162 (GB). Soccage is given as "a tenure by any certain and determinate service" by <http://dictionary.oed.com>; this may be either an antique, broader use of the word or perhaps Tomlinson means to write something else.



of sodium. The former being sparingly soluble, is easily separated. *Lime, moreover, directly decomposes the chloride of magnesium, but with the effect of merely substituting chloride of calcium in its stead*: but in general there is abundance of sulphate of soda present to decompose the chloride of calcium, especially in brine springs.<sup>53</sup>

The same technique of adding lime to the brine could be applied in cases where heat was not present (*italics added*):

A still preferable method would be to add to it, *in the settling tank*, the *quantity of lime equivalent to the magnesia*, whereby an available deposit of this earth would be obtained, at the same time the brine would be sweetened. The solution, thus purified, may be safely crystallized by rapid evaporation.<sup>54</sup>

Tomlinson (1850) describes this technique of using lime to purify brine obtained from frozen lakes in Russia (*italics added*): "The salt thus obtained is, however, very impure, unless the precaution is taken beforehand to *purify the brine by means of lime*."<sup>55</sup> Sometimes the 19th century accounts of this process attribute it to a relatively recent European chemist: this seems peculiar because the ingredients are ancient and saltmakers have a need for such a process, both reasons for suggesting the technique itself is much older.

#### D. SALT, WATER AND LIME

Salt and lime react together in a number of interesting ways. In particular, there is a modern process with ancient origins using salt and lime that may help to illustrate some of these interactions: the 19th century Solvay process for sodium carbonate. The Belgian industrial chemist Ernest Solvay (1838-1922) is best known (*italics added*):

---

<sup>53</sup> Huskisson (1853), p. 428 (GB).

<sup>54</sup> Huskisson (1853), p. 428 (GB).

<sup>55</sup> Tomlinson (1850), p. 278 (GB).

for his development of a commercially viable ammonia-soda process for producing soda ash (sodium carbonate), widely used in the manufacture of such products as glass and soap. After attending local schools, Solvay entered his *father's salt-making business*. At the age of 21 he began working with an *uncle at a gasworks* near Brussels, and while there he began to develop the conversion method for which he is known.<sup>56</sup>

The happy accident of a father in the saltmaking business and an uncle at a gasworks without doubt helped him solve "the practical problems of large-scale production by his invention of the Solvay carbonating tower, in which an ammonia-salt solution could be mixed with carbon dioxide."<sup>57</sup>

Essentially, this interesting process uses salt brine and limestone to make sodium carbonate, written in chemical shorthand:  $2\text{NaCl} + \text{CaCO}_3$  reacted together produces  $\text{Na}_2\text{CO}_3 + \text{CaCl}_2$ .<sup>58</sup> The first part of this process passes carbon dioxide ( $\text{CO}_2$ ) through a concentrated aqueous solution of sodium chloride ( $\text{NaCl}$ ) and ammonia ( $\text{NH}_3$ ) producing sodium bicarbonate ( $\text{NaHCO}_3$ ) and ammonium chloride ( $\text{NH}_4\text{Cl}$ ), written as  $\text{NaCl} + \text{CO}_2 + \text{H}_2\text{O}$  yields  $\text{NaHCO}_3 + \text{NH}_4\text{Cl}$ .<sup>59</sup> Wikipedia has one of the better descriptions of the details of the process (italics added):

In industrial practice, the reaction is carried out by passing concentrated brine through *two towers*. In the first, ammonia bubbles up through the brine and is absorbed by it. In the second, *carbon dioxide* bubbles up through the ammoniated brine, and sodium bicarbonate ( $\text{NaHCO}_3$ ) precipitates out of the solution. Note that, in a basic solution,  $\text{NaHCO}_3$  is less water-soluble than sodium chloride. The ammonia ( $\text{NH}_3$ ) buffers the solution at a basic pH; *without the ammonia, a hydrochloric acid byproduct would render the solution acidic, and arrest the precipitation.* ... When properly designed and operated, a Solvay plant can reclaim almost all of its ammonia, and consumes only small amounts of additional ammonia to make up for losses. *The only major inputs*

---

<sup>56</sup> "Solvay, Ernest," *Encyclopaedia Britannica*. 2008. Encyclopaedia Britannica Online. 10 Jan. 2008, <http://search.eb.com/eb/article-9068636>.

<sup>57</sup> "Solvay, Ernest," EB Online, 2008.

<sup>58</sup> Wikipedia.

<sup>59</sup> [http://en.wikipedia.org/wiki/Solvay\\_process](http://en.wikipedia.org/wiki/Solvay_process), 14 Jan 2008.

to the Solvay process are salt, limestone and thermal energy, and its only major byproduct is *calcium chloride*, which is sold as road salt.<sup>60</sup>

The carbon dioxide, as previously discussed, comes from the "heating ("calcination") of the limestone at 950-1100 C. The calcium carbonate ( $\text{CaCO}_3$ ) in the limestone is partially converted to quicklime (calcium oxide ( $\text{CaO}$ )) and carbon dioxide:  $\text{CaCO}_3$  [with heat] yields  $\text{CO}_2 + \text{CaO}$ ."<sup>61</sup>

The sodium bicarbonate precipitate is then filtered from the ammonium chloride solution and heated to drive off the carbon dioxide and water, becoming sodium carbonate:  $2\text{NaHCO}_3$  with heat yields  $\text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$ . The ammonium chloride solution has added to it the calcium oxide "left over from heating the limestone:"<sup>62</sup>  $2\text{NH}_4 + \text{CaO}$  gives  $2\text{NH}_3 + \text{CaCl}_2 + \text{H}_2\text{O}$  or ammonium chloride and lime (calcium oxide) yield ammonia, calcium chloride and water. Notice again that the ammonia is a catalyst for this operation and most of it is recovered.

Solvay received his patent in 1861. But the process "had been understood since 1811" although "a suitable and economical means of large-scale commercial production had evaded industrial chemists."<sup>63</sup> An English patent was issued in 1834. Prior to this Nicolas LeBlanc in 1791 discovered a method for doing the same thing with salt, limestone, sulfuric acid and coal.<sup>64</sup> Indeed, almost until the end of the nineteenth century, "the ammonia-soda process encountered stiff competition from the older LeBlanc process, but it ultimately prevailed because it produced soda ash more cheaply."<sup>65</sup>

A description in English of the Solvay process without the ammonia catalyst dates to at least 1823 (*italics added*):

<sup>60</sup> [http://en.wikipedia.org/wiki/Solvay\\_process](http://en.wikipedia.org/wiki/Solvay_process), 14 Jan 2008.

<sup>61</sup> [http://en.wikipedia.org/wiki/Solvay\\_process](http://en.wikipedia.org/wiki/Solvay_process), 14 Jan 2008.

<sup>62</sup> [http://en.wikipedia.org/wiki/Solvay\\_process](http://en.wikipedia.org/wiki/Solvay_process), 14 Jan 2008.

<sup>63</sup> "Solvay, Ernest," EB Online, 2008.

<sup>64</sup> "Heavy Inorganic Chemicals," *Encyclopaedia Britannica*. 2008.

Encyclopaedia Britannica Online, 10 Jan 2008, <http://search.eb.com/eb/article-82216>.

<sup>65</sup> "Ammonia-Soda Process," *Encyclopaedia Britannica*. 2008. Encyclopaedia Britannica Online, 10 Jan 2008, <http://search.eb.com/eb/article-9007201>.

It has been proposed to *decompose sea-salt by means of lime, for obtaining the soda*. Soda is separated from the acid by mixing the common salt with lime, in the form of a paste, and by exposing it to moisture. In a short time the soda appears on the surface in a state of efflorescence. Scheele, it is observed by Berthollet, was the first who noticed the decomposition of the muriate of soda [sodium chloride] by means of lime. He explains the decomposition by showing, that *lime* acts on salts with fixed alkaline bases. It *decomposes a small part of the muriate of soda, with which it is in contact, and the soda, eliminated by this means, combines with the carbonic acid of the atmosphere* [carbon dioxide]. The carbonate of soda effloresces, so that it opposes all resistance to the action of the lime, and *the decomposition continues until it is impeded by the quantity of muriate of lime* [calcium chloride] formed. ... A manufactory for the purpose of extracting soda from sea-salt, by means of lime, was established in France by Guyton.<sup>66</sup>

The Swedish chemist Carl Wilhelm Scheele (1742-1786)<sup>67</sup> may or may not have been the first European to notice this effect but it certainly recalls the recipe for producing a Chinese century egg, without the egg, tea or wood ash.

Soda ash helps make such useful items as glass, paper and soap. The ingredients and technology for producing it are simple and ancient. The name of the first Chinese to combine hot lime with a brine solution is not recorded.

## E. OPIUM

The other ingredient, besides fresh water, in Lin's recipe is opium. Lin's opium in the vats at Chunhow has been brought to him by the foreign opium traders; it is not domestically produced from Chinese *Papaver somniferum* L. The increased suppression of the domestic cultivation of the poppy and the domestic production of opium begun at the beginning of the 1830s was most likely the reason why Lin's confiscated opium had come from outside the

---

<sup>66</sup> Encyclopaedia Britannica; Or, a Dictionary of Arts, Sciences and Miscellaneous Literature. Sixth edition. Vol. V. Edinburgh: Archibald Constable and Company, 1823, p. 570 (GB).

<sup>67</sup> From [www.vanderkrogt.net/elements/elem/cl.html](http://www.vanderkrogt.net/elements/elem/cl.html).

country.<sup>68</sup> In his first memorial to the emperor on the disposition of the opium, Lin mentions three kinds:

There are different kinds of opium. The black opium is called *Kung pan tou* (Patna), said to be the best. Next to it is *Pak tou* (Malwa). Still inferior is *Chin hwa tou* (Persian). ... Generally speaking, *Kung pak tou* and *Pak tou* form the major part, while *Chin hwa tou* is less than one per cent.<sup>69</sup>

In his second memorial to the emperor on the same subject, he adds a fourth type:

In our previous memorial we have represented that the opium is of three kinds - *Kung pan*, *Pak tou*, and *Chin hwa*. We however have found later when breaking the original chests still another kind, namely, small *Kung pan*. ... We are informed that this is the best species in foreign countries and costs very much. So the opium now destroyed consists of four different kinds.<sup>70</sup>

Lin did not process "eight chests, two of each kind (Patna, Malwa, Turkey, and small Patna)."<sup>71</sup> He says he does so to avoid cheating in the ongoing Chinese surrendering of opium:

But, as we see it, in order to decipher what is false, it is most important to know what the true is like. We do not know what is the opium seized in different localities lately. If we can compare it with the opium contained in the original chests, then the true and the false can be instantly differentiated.<sup>72</sup>

*Kung pan tou* and small *kung pan* had been cultivated near Patna and Benares, in northeast India, on the river Ganges. The poppy capsules were incised in February and the opium collected and transported to factories at Ghazipur (close to Benares) and Patna. Fay says the "Ghazipur works drew on over 400,000 acres of the poppy" and the Patna works "almost half a million."<sup>73</sup> By April

---

<sup>68</sup> See Appendix A - Silver, Salt and Opium.

<sup>69</sup> Kuo, p. 247.

<sup>70</sup> Kuo, p. 249.

<sup>71</sup> Chang, p. 174.

<sup>72</sup> Kuo, p. 249.

<sup>73</sup> Fay, p. 5.

or early May, at these factories the collected opium had been "tipped into big stone vats" where it was stirred "until the intense dry heat of the north Indian plain had lowered the water content to 30 percent."<sup>74</sup> It was then formed into balls (Fay calls them cakes), allowed to air dry and packed in chests.

Lin's *Pak tou* came from Malwa, on the other side of the subcontinent, in northwest India. Malwa was formed into small, flat cakes "thus easier to smuggle into China than the large and globular Bengal cake."<sup>75</sup> Originally, most of the opium shipped by the British East India Company had been Bengal (Patna and Benares, or *Kung pan*), sold and shipped from Calcutta. But by the decade 1831-1840, Malwa (*Pak tou*) exceeded the Bengal by more than two to one. Since most of Lin's opium came from India, probably two-thirds of it was Malwa. Only the smallest part, less than one percent, was *Chin hwa tou* which had come from Turkey.

Opium differed in its morphine content depending on the variety of the plant, where it was grown and how it was processed. Figures for this can be misleading. The morphine content can vary from season to season and even from capsule to capsule on the same plant (*italics added*):

The Smyrna opium is generally considered the best in the European market, but even in this *the morphia varies between four and fourteen percent*. ... Generally, also, the Indian and Persian samples yield less morphia than those of Turkey. ... British-grown opium contains more morphia than that of commerce [and some report] the *presence of 16 to 28 percent of morphia* in some opium collected in France.<sup>76</sup>

As a result, most authors generally assign a number of ten percent for the average morphine content of opium.<sup>77</sup>

---

<sup>74</sup> Fay, p. 13.

<sup>75</sup> Chung, p. 85.

<sup>76</sup> "The Narcotics we indulge in - Part II," *Blackwood's Edinburgh Magazine*. Vol. LXXXIV. July-Dec 1853. American edition - Vol. XXXVII. New York: Leonard Scott and Company, 1853, p. 613 (GB).

<sup>77</sup> Fay, p. 8.

## F. DISCUSSION

One of Lin's first jobs was salt controller for the Chinese salt monopoly. Throughout his career he shows himself intensely curious about all aspects of every job he takes on. The technology of constructing a series of cascading salt ponds would have been available to him. Lin's salt for his processing of the foreign opium most probably came from the salt ponds of maritime Guangdong province. The salt used by Robinet and Robiquet was also *sel marin*, or sea salt.

Lin's "whole pieces of thoroughly heated limes" could be shell or limestone partially broken down by the heat of a simple kiln to become a kind of coarse limestone and quicklime or calcium carbonate and calcium oxide. Lin is slaking lime as part of his processing of the opium.

Lin more than likely would have understood how salts crystallize; he might have known how to use lime to sweeten salt brine. Lime added to seawater precipitates the magnesium chloride, a process later patented by the Dow company.

Quicklime and a salt brine react together with ammonia as a catalyst in what is known as the Solvay process for producing sodium carbonate. Though the Solvay process was patented only in 1861, the technique had been used in Europe since at least 1811, without the ammonia. Barbier, Heumann and Merck use sodium carbonate to precipitate the alkaloids from opium (see chapters twelve and seventeen).

Lin's opium comes from India where it has had the moisture content reduced. The amount of morphine present would have varied, perhaps averaging around ten percent.

With sea salt, lime, opium and fresh water, Lin has his basic ingredients. With the proper equipment and a recipe, can he extract from opium its morphine?

## XXII THE EQUIPMENT

---

- XXII. THE EQUIPMENT
- A. LIN'S PROJECTS
  - B. MANAGEMENT AND ORGANIZATION
  - C. SITE PREPARATION AND PERIMETER SECURITY
  - D. STORAGE FACILITIES
  - E. TANK SECURITY AND HOUSING
  - F. TANK CONSTRUCTION
  - G. SUPPLY AND LOGISTICS
  - H. COMMUNICATIONS
  - I. FUNDING
  - J. DISCUSSION AND QUESTIONS

*L*IN, whether from his own experience as salt controller, the Chinese purifiers, the European chemists or all three, has the knowledge. He has the basic ingredients. Next he needs the equipment in which to do his experiment. It will take some judgment and good guesses to reconstruct what Lin would have had to have done, but simply from the descriptions already provided, this would have been the largest single batch-process separation of opium in the world.

### A. LIN'S PROJECTS

Lin is no stranger to big jobs. He thinks big. In 1833, he recommends to the emperor that China mint its own silver dollars. Dr. Chang writes that the emperor was not amused and reprimanded him.<sup>1</sup> Gutzlaff says the emperor later partly changed his mind: "It was in imitation of the (Spanish) dollar, that the

---

<sup>1</sup> Chang, p. 123-124.



reigning monarch, not long ago, issued pieces of money nearly equal in weight, but of fine silver, with which the soldiers are paid."<sup>2</sup> Throughout his career Lin is called upon to solve serious problems in flood control, sea transportation, salt administration and military affairs. Under the Manchu dynasty, this Han Chinese scholar is appointed censor, intendant, judicial commissioner, financial commissioner, governor and governor-general. "Before he set out for his work at Canton, Lin had already gained distinction for his accomplishments in water conservation, flood control, social relief, and management of tax collection."<sup>3</sup>

He conceives jobs that need considerable management. "A immense amount of organization was required to arrange for the safe delivery of the opium from the English ships to small boats, and from the small boats to the point near Chuenpi where it was to be accumulated."<sup>4</sup> He proposes, facetiously, that the surrendered opium be shipped to Peking:

Teng Ying, a censor of the Chekiang circuit ... estimated that in Kwangtung, Kiangsi, and Anhwei, it would take at least forty thousand bearers to carry the opium overland, and more than a hundred large boats with crews totaling one or two thousand men to transport it by water. North of Anhwei, over a thousand carts with the same number of laborers and five or six thousand horses and mules would be required; and even if the opium were transferred from the river in Kiangsi through the Yangtze to the Grand Canal, it would require several times the number of boats used in the regular shipment of copper and lead.<sup>5</sup>

Later, blamed for causing the war, Lin is exiled to Ili. But along the way, he is ordered to help with dike repair during a major flood at Xiangfu. Once again he shows himself

a skillful and knowledgeable manager who understood provincial finance. After his arrival, the burden of organization and management fell almost

---

<sup>2</sup> Gutzlaff, K. F. *China Opened*. Vol. 2. London: Smith, Elder and Company, 1838, p. 19 (GB).

<sup>3</sup> Chang, pp. 122-124.

<sup>4</sup> Waley, p. 40.

<sup>5</sup> Chang, pp. 172-173.

entirely upon him. Organizing and housing troops and workers were major tasks. In particular, housing and food had to be found for the specialists in the construction of stalk revetments, for the troops transferred from other areas to maintain security, and for the clerks and runners (*tingchai shuryi*). ... Besides providing housing, the officials set up workshops to manufacture such items as candles, paper and rope. Ferries were put into service to take workers and materials across the river ....<sup>6</sup>

Lin conceives of large projects and is not daunted by the mere size of any particular task.

## B. MANAGEMENT AND ORGANIZATION

The disposal of the opium, "like the delivery, required an immense amount of organization."<sup>7</sup> Bridgman observes the war-boats and junks at the landing place and that "two divisions of troops, in full uniform, were drawn up under their respective standards, one on the south, the other on the north of the enclosure."<sup>8</sup> He observes: "A good many boats were passing and repassing the river, exhibiting on all sides the aspect of quiet and industry."<sup>9</sup> Bridgman estimates 500 workmen being ticketed as they enter the palisade and examined as they leave.<sup>10</sup> He guesses 60 or 80 hand-picked officers onsite:

A collection of finer looking men I have scarcely ever seen. Many of these officers were employed as inspectors and overseers. A part of them were on elevated seats, under mat sheds, to watch all the movements, in every part of the enclosure; and their position was such that nothing could escape their notice.<sup>11</sup>

---

<sup>6</sup> Dodgen, Randall A. Controlling the Dragon: Confucian Engineers and the Yellow River in Late Imperial China. Honolulu: University of Hawaii Press, 2001, p. 95 (GB).

<sup>7</sup> Waley, p. 49.

<sup>8</sup> *CR*, vol. 8, p. 72 (GB).

<sup>9</sup> *CR*, vol. 8, p. 72 (GB).

<sup>10</sup> *CR*, vol. 8, p. 73 (MD).

<sup>11</sup> *CR*, vol. 8, p. 73 (MD).

"Only the most trusted of his subordinates were used as superintendents of the work, and the coolies employed were stripped and searched when they knocked off from work every night,"<sup>12</sup> says Waley. King notices the chests of opium being reweighed in the presence of "high officers," the large number of workmen, that the spot was well-guarded and the workers were ticketed.<sup>13</sup> Bridgman confirms King's observation of the attention employed with the chests:

Another part of the officers superintended the delivery of the opium from the chest, which had been stored up in small enclosures within the large one. Special care was taken to see if each chest and parcel now corresponded to what it was marked down, when taken from the store-ships.<sup>14</sup>

Lin may have learned these techniques for careful regulation and inspection of the opium when he was a salt controller. Sir Francis Doyle, chairman of the Board of Excise testified before the Parliamentary Committee in 1835 as to the kind of regulations that were imposed on salt in Britain when it too was under government monopoly:

The rock-salt raised from the mines was sent under permit to the different refineries ... where it was deposited in warehouses into which it was weighed by the officer of excise. (When required) the officer weighed it out to them, on notice to that purpose. ... When they wished to remove it from the pans, notice was given to that effect by the trader to the officer, who attended and saw the salt taken out of the pans and carried into a separate warehouse. ... (T)he salt remained here under lock until the trader desired to deliver it out when the excise officer attended and took an account of the quantity delivered out, and granted a permit.<sup>15</sup>

But the careful regulation of the opium is merely indicative of Lin's extreme attentiveness to detail with regards to the organization and

---

<sup>12</sup> Waley, p. 49.

<sup>13</sup> Allen, p. 48 (GB).

<sup>14</sup> *CR*, vol. 8, p. 73 (MD).

<sup>15</sup> Tomlinson (1850), pp. 63-65 (GB).

management of the operation itself, a task involving 500 workmen, 60 to 80 overseers, two divisions of troops, the local Chinese navy and a number of other small boats engaged in some form of industry.

### C. SITE PREPARATION AND PERIMETER SECURITY

His diary records him inspecting the trenches on 13 May but it is reasonable to assume that site preparation would have had to have begun before then. In fact, his letter to the emperor of 12 April has him (probably) shipping the opium direct from Lankit to Chunhow.

The site chosen is "on the bank of the creek, at the brow of a hill, a short distance from the north end of the village" of Chunhow.<sup>16</sup> First, it would have been necessary to clear the land, removing any trees and shrubs that might have interfered with his operation or lines of sight. He must fence the area, some 1600 to 2000 linear feet, or roughly a third of a mile of bamboo palisade. Bridgman says it was "strongly impaled with bamboo" and "surrounded by a strong palisade, like a Malayan camp."<sup>17</sup> Captain P. J. Begbie described a palisade in Malaysia: "The stockade being composed of upright posts, which precluded scaling ...."<sup>18</sup>

It is of course purely speculative, but if each bamboo is six inches in diameter and they stand side by side, it would have taken between 3200 to 4000 lengths of bamboo, guessing at 10 feet long each, so Lin must have given orders to hack down a small bamboo forest, or several. The bamboo must be cut by someone and transported by someone, so he must have another corps of men with machetes and a separate crew to haul it, perhaps with oxcart, so he needs a road or trail constructed to the forest. For a strong palisade able to deter the more than ten attempts at theft,<sup>19</sup> the bamboo perhaps should have its first two feet dug into the ground and the

<sup>16</sup> *CR*, vol. 8, p. 72 (GB).

<sup>17</sup> *CR*, vol. 8, pp. 72 (GB)-73 (MD).

<sup>18</sup> Begbie, P. J., Captain. The Malaysian Peninsula, Embracing its History, Manners and Customs, etc. Madras, India: Printed for the author at the Vepery Mission Press, 1834, p. 215 (GB).

<sup>19</sup> Chang, p. 174.

other end sharpened, so he has another crew busy with hoes and shovels and more machetes. This wall needs to be fastened together in some manner, and if he uses rope he needs a source of rope and he needs miles of it.

Bingham noticed the Chinese needing neither nails nor rope and building bamboo structures quite rapidly. Regarding the British fleet during the war anchored near Macao and the Chinese village that supplied them, he wrote:

When the shipping shifted their anchorage the whole town moved too; and it was strange to see with what rapidity it presently sprang up on a sandy and barren spot, four-and-twenty hours sufficing for the operation. The houses were formed of bamboo poles and mats, and the whole male and female population were generally employed in their erection. No nails were required, no carpenter wanted, the whole being bound together with thin strips of bamboo, - the most useful tree in the world."<sup>20</sup>

In which case someone has to cut miles of these thin strips.

Lin also needs to construct separate fences around each tank with gates on only one side, another 1,350 linear feet. On the outer palisade he constructs three gates, north, south, and one on the west on the river. One gate would have afforded more security. Why does he need three gates? Bridgman notices the sentries at each gate searching the workmen who are leaving. It is 11:00 a.m.<sup>21</sup> Three gates implies the need to accomodate a significant amount of foot traffic both going and coming for the 500 workers. Bridgman does not say where the salt and lime came from before they arrived at tank two. Also on the riverside, Lin must build a pier so the *Morrison's* gig can tie up.

#### D. STORAGE FACILITIES

Lin must construct enough small storage sheds to house roughly 20,000 chests of opium each weighing about 170 pounds

---

<sup>20</sup> Bingham, p. 408 (GB).

<sup>21</sup> Bridgman, *CR*, vol. 8, p. 73 (MD).

according to Fay<sup>22</sup> or between 125 to 140 pounds according to Shuck<sup>23</sup> and with a net weight of at least a picul or 133 and one third pounds according to Chang.<sup>24</sup> Shuck describes the Bengal opium as being made

into balls about the size of two fists, and covered with a hard skin, made of the petals of the poppy, each ball having a separate apartment in the chest when sent off to market. The chest is made of mango wood, and consists of two stories, each story containing twenty balls.<sup>25</sup>

If each ball is the size of two fists and there are 40 balls to a chest, packed 20 on each of two levels, each chest must be the size of a small footlocker and weigh what a footlocker would weigh if it were packed with books. It must be at least a foot and something high, the same wide and five feet plus long. Each ball has almost a six inch diameter as that is the size of the cup in which it was made in India. Fay says the India operation looked like this:

Down the sides of the caking room sat the cake-makers. Beside each was a brass cup not quite six inches in diameter, several bundles of petal sheets, a container of inferior opium in the semiliquid form known as *lewah*, and a box of crushed, dried poppy stems and leaves called "poppy trash." Taking up the cup, the cake-maker lined it with petal sheets, smearing each with *lewah* and pasting sheet upon sheet until he had formed a shell half an inch thick. Next he received from an assistant a lump of opium a little over three pounds in weight and dropped it into the shell. Steadying the lump with one hand, he applied petal sheets to it with the other, tucking the sheets in to meet the already constructed shell and building steadily upwards until they met at the top and were sealed with a last sheet and a final smear of *lewah*. The finished cake was then rolled in poppy trash and removed to an earthenware cup the size of the brass one. "As thus formed," says Eatwell [an opium examiner in the 1830s], "the well-finished cake is a pretty regular sphere not unlike in size and appearance a twenty-four pound shot."<sup>26</sup>

---

<sup>22</sup> Fay, p. 5.

<sup>23</sup> Shuck, p. xii (GB).

<sup>24</sup> Chang, p. xvi.

<sup>25</sup> Shuck, pp. xi-xii (GB).

<sup>26</sup> Fay, p. 13.

If the balls in the chest were arranged in rectangular rows with separate dividers, this would mean a chest with the rough dimensions 15 inches by 15 inches by 5 feet. Then a ten foot by ten foot by ten foot storage shed can accomodate 128 chests, implying that a few more than 150 of these sheds, supposing them also to be built with bamboo because Bridgman simply calls them smaller enclosures, perhaps in three rows of 50 each, would have housed the entire 20,000 chests.

Kuo's Lin describes the chest as being "about three feet long and half that in both height and width" with each piece "weighing about three catties."<sup>27</sup> He says "a large house can accomodate only about four or five hundred chests."<sup>28</sup> Lin writes "we found it necessary to put several buildings together, encircling them with a fence and covering them with a high roof."<sup>29</sup> At five hundred chests per building, Lin only needs forty large buildings to store his opium. Tan Chung points out that there were at least two different sized chests: "The Malwa chest adopted the Chinese picul weight (a picul weighing 133 and one-third lb.) which was more convenient for Chinese counting than the two-factory-maunds (weighing 149 lb.) Bengal chest."<sup>30</sup> Whatever their dimensions, if he is shipping them direct from Lankit or Chuenpi to Chunhow, Lin must begin building these storage sheds by or soon after 12 April when he begins to receive the chests from the foreigners.

#### E. TANK SECURITY AND HOUSING

Lin also needs to build the watch towers like the one near the boat where Charlotte King will enjoy her tea and sweetmeats. Inside the compound he needs more watch towers with elevated seats and matted roofs against the sun for the officers to sit under while watching the workmen.<sup>31</sup> Lin describes them not as watch

<sup>27</sup> Kuo, pp. 245, 240. The online original has *san1 che3* or literally "three feet," that is Chinese feet (roughly one-third of a meter).

<sup>28</sup> Kuo, p. 245.

<sup>29</sup> Kuo, p. 245.

<sup>30</sup> Chung, p. 85.

<sup>31</sup> *CR*, vol. 8, pp. 73-74 (MD).

towers, but writes to the emperor that on the banks of the ponds "there are fences which embrace seats for officers of inspection."<sup>32</sup> Every one of the 600 or so men employed at the task needed to be housed, fed and clothed and Lin would have had to maintain a small village, perhaps Chunhow or somewhere close, for this business of maintaining the workers.

Lin needs management housing, his temporary residence, no doubt also of bamboo, "large and commodious" in Bridgman's words. "The hall of audience was about twenty feet square, a little elevated, and open on the west side .... The floor was covered with carpets and the walls decorated with scrolls."<sup>33</sup> He will also need several other apartments, for sleeping, working, bathing, and storage for the luggage he brought down with him from Peking, "which weighed over 5000 pounds."<sup>34</sup> Lin would probably enjoy a small flower garden as well.

#### F. TANK CONSTRUCTION

Next, and most important, he needs to dig the trenches, vats, tanks or receptacles. Each is 150 by 75 by 7 feet, and he needs to excavate three of them. Specifically, Lin needs to excavate almost a quarter million cubic feet of earth, roughly digging up two-thirds of a U. S. football field down to the depth of seven feet. All this dirt and stone must be put somewhere. He can haul it away by double oxcart, and if each one holds 100 cubic feet, he needs 2500 oxcart trips. He could have loaded it in baskets into small boats at creekside and dumped it somewhere downstream, but Lin is a skilled civil engineer so perhaps he simply extended or built up the embankment at the side of the stream.

At seven feet deep, he is more than likely going to dig through topsoil, subsoil and encounter stone at some point. If he has chosen the site well, it will be limestone, which will be just fine for burning

---

<sup>32</sup> Kuo, p. 246.

<sup>33</sup> *CR*, vol. 8, p. 74 (MD).

<sup>34</sup> Waley, p. 20.



on site to make "whole pieces of thoroughly heated limes,"<sup>35</sup> of which he will need many baskets as well as many fires. If not, he can get the local salt controller to bring shells from the coastal salt works by boat, where they will be able to make it on the site, again using countless fires. Neither Bridgman nor King notice any fires or kilns at Zhenkou.

Now that the trenches are dug, Lin needs to line them with stone if he has not already encountered bedrock. For this, Lin needs 33,750 square feet of stone, which he could have saved from his excavation, but if it isn't the right stone he will have to haul it in from a quarry with more oxen and more boats.

But he's not done yet, because he must timber the sides of his tanks with nearly 10,000 square feet of timber, depending on the thickness some 10,000 to 20,000 board feet, which incidentally would have made a very hot fire if it had had some handy wutung oil to go with it.

For this part of the job, he will need a not insubstantial logging operation of a small forest, more oxcarts, more boats, a large crew with axes, adzes and saws, several saw pits or saw mills, all work to be done by hand.

He must not forget to build the forms, perhaps of bamboo, for tank two and cut the planks that extend across them. Finally, he must construct sluices, perhaps three, and the screen that Bridgman sees on tank three.

## G. SUPPLY AND LOGISTICS

For the operation of his tanks, Lin must bring water, salt, lime and opium to them. Bridgman says fresh water was brought in "from the brow of the hill."<sup>36</sup> Did he dig a channel from the creek to feed the tanks? Chung says he dug a ditch.<sup>37</sup> Lin says he built an aqueduct.<sup>38</sup> After lining the bottom of his tanks with stone and

---

<sup>35</sup> Kuo, p. 246.

<sup>36</sup> *CR*, vol. 8, p. 73 (MD).

<sup>37</sup> Chung, p. 199.

<sup>38</sup> Lin, in Kuo, p. 246.

timbering the sides, it is unlikely he wants to convey muddy water into them from a ditch. The aqueduct seems more likely if he intends to keep his tanks free from the surrounding soil. Of course, this begs the question of why does he bother, if his purpose is to destroy the opium, to keep out the dirt in the first place. Clearly, Lin prefers a clean separation of his opium, not a dirty one.

The salt could be had from a local mine, but probably comes from the seacoast where the lime might have come from as well. All of which could conveniently have been transported by chop boat. Bridgman notes a number of small boats busily engaged near the site. The provincial salt controller comes over to see the process in the early part of June.<sup>39</sup> Lin had been a salt controller in a province further north so they would have had a lot to talk about. Wong Tak-yan, whose family operated lime kilns in Hong Kong from when it was established, reports: "Most lime kilns were built near the shore, so that the kiln could have a private pier to facilitate the transport of the finished product and of raw materials by boat."<sup>40</sup>

How much salt and lime did Lin use? It is only possible to make a number of guesstimates and so hopefully create an upper and lower bound for the operation. Bridgman simply says the salt and lime were spread "profusely over the whole surface of the trench."<sup>41</sup> What does "profusely" mean? Bridgman was only there for half an hour and doesn't record that he counted the number of baskets of salt or lime being spread. The quantity, thick or thin, will depend first upon how much water there is in the tank.

The total surface area of a single tank of 150 by 75 feet is 11,250 square feet. Figuring by volume, if the water is two feet deep, each of Lin's tanks contains 22,500 cubic feet of water. Bridgman says workmen were in tank two so the water could not have been much higher than the two feet he observed in the first tank.<sup>42</sup> Otherwise, they would have found it difficult wading about with their plows.

---

<sup>39</sup> Chang, p. 173.

<sup>40</sup> Wong, Tak-yan. "Lime-making on TsingYi," from <http://sunzi1.lib.hku.hk/hkjo/view/44/4401562.pdf>, p. 295.

<sup>41</sup> *CR*, vol. 8, pp. 73-74 (MD).

<sup>42</sup> *CR*, vol. 8, p. 73 (MD).

If a pound of salt and a pound of lime was used per cubic foot of water (a ratio chosen for simplicity), then Lin needs to transport to a single tank 22,500 pounds of salt, per day, for twenty-two days. If he works all three tanks, and each tank contains two feet of water, then the total volume of water in the three trenches is 67,500 cubic feet. The carrying capacity of a 48 foot semitrailer is 47,000 pounds.<sup>43</sup> If each of Lin's 500 workmen carries a 50 pound basket of salt, Lin can more than fill all three of his tanks with a pound of salt per cubic foot of water with only three round trips from dockside to tank per person.

Lime in the 21st century is often delivered in self-unloading pneumatic trucks. "A truckload of bulk quicklime weighs about 25 tons (50,000 pounds). ... A truckload of bulk hydrated lime weighs about 18-25 tons (36,000 to 50,000 pounds)."<sup>44</sup> So Lin needs to order about a truck and a half of quicklime to fill all three of his tanks with lime, every day, again about three round trips from the kilns or the pier to the tanks for each of his 500 hired laborers based on a 50 pound basket.

But this initial estimate was only chosen for simplicity of calculation. It seems quite light when compared to the experiments made by the European chemists. For example, Robinet used a 15 percent salt solution.<sup>45</sup> Figuring by volume, if in any given tank there are 22,500 cubic feet of water, and if 15 percent of this is salt, then Lin needs 3,375 cubic feet of salt per tank and if he works all three tanks, then 10,125 cubic feet of salt. Salt (NaCl) weighs 72 lbs/cubic foot.<sup>46</sup> At 72 pounds per cubic foot, this salt total would

---

<sup>43</sup> "Semi-truck specifications," Arab Cartage and Express Company, Arab, AL, [www.arabcartage.com/equipment.htm](http://www.arabcartage.com/equipment.htm). Approximately 10,227.2 kilograms of salt per tank per day.

<sup>44</sup> Cheney Lime and Cement Company of Allgood, AL, [www.cheneylime.com/products.htm](http://www.cheneylime.com/products.htm).

<sup>45</sup> "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. I, Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 199 (GB). See also chapter sixteen.

<sup>46</sup> [http://wiki.answers.com/Q/How\\_much\\_does\\_sea\\_salt\\_weigh\\_per\\_cubic\\_foot](http://wiki.answers.com/Q/How_much_does_sea_salt_weigh_per_cubic_foot).

have weighed 729,000 pounds and Lin would have needed a little over 15 and a half of those same 48 foot semi-trailers of salt every day to fill all three of his tanks.<sup>47</sup>

But Robinet's solution was not 15% by volume, it was 15% by weight. With 22,500 cubic feet of water at 62.4 pounds per cubic foot,<sup>48</sup> the water weighs 1,404,000 pounds and 15 percent of this would weigh 210,600 pounds. Per tank Lin must place an order for four and a half semi-trailers of salt per day, or better than eight round trips for each of his 500 laborers each with a 50 pound basket of salt from pier to tank. If he uses all three tanks every day, then Lin needs to transport 631,800 pounds of salt to his jobsite every day for 22 days and the number of round trips per worker with a 50 pound basket of salt is a little over twenty-five.

But adding 15% by weight of salt, while convenient for a scratch pad calculation, does not produce a 15% solution of brine, but something less. A better estimate is provided courtesy of the fishing industry, which commonly uses brine solutions:

About 20 gallons of brine are needed at 15.8% salt (60 degrees SAL) to brine salmon for smoking. If it isn't necessary to have exactly 20 gallons, simply find 60 degrees SAL (15.8% salt) in column 1 and note that 1.568 pounds salt/gallon of water (column 4) is needed. Put 20 gallons of water in a tank and dissolve 31 and one-third pounds of salt (20 gallons x 1.568 pounds salt/gallon water). The result will be a solution that has exactly 15.8% salt by weight (60 degrees SAL). It will be found however, that the resulting solution is more than 20 gallons; it will be more like 21 gallons. This increase in volume is usually insignificant.<sup>49</sup>

---

<sup>47</sup> "At New Orleans, the equivalent of 166 semi-trailers of water flow past Algiers Point each second. ... A 48 foot semi-truck trailer is a 3,600 cubic foot container." - "General Information about the Mississippi River," [www.nps.gov/archive/miss/features/factoids](http://www.nps.gov/archive/miss/features/factoids). Approximately 331,363.6 kilograms of salt.

<sup>48</sup> According to [www.greencheck.com/technical/files](http://www.greencheck.com/technical/files), [www.letiecq.org/gletiecq/conversions.html](http://www.letiecq.org/gletiecq/conversions.html), [www.fourmilab.ch/hackdiet/www/subsection1\\_4\\_2\\_7.html](http://www.fourmilab.ch/hackdiet/www/subsection1_4_2_7.html), and <http://wiki.answers.com>.

<sup>49</sup> Hilderbrand, K. S. "Preparation of Salt Brines for the Fishing Industry," p. 3/4, <http://seagrant.oregonstate.edu/sgpubs/onlinepubs/h990002.pdf>.

Referring to the same table, a 15.3% salt solution by weight can be produced using 1.505 pounds of salt per gallon of water.<sup>50</sup> Lin's tank two has 22,500 cubic feet of water and at 7.48 gallons to the cubic foot,<sup>51</sup> contains 168,300 gallons. Using 1.5 pounds of salt per gallon means Lin must add 252,450 pounds of salt to obtain a 15.3% salt solution by weight. Now Lin must order a little over 5 semi-trailers of salt for pond number two or better than 10 round trips for each of his 500 workers carrying a 50 pound basket of salt. If Lin uses all three tanks simultaneously, he must have transported to his tanks for a 15% solution some 757,350 pounds (344,250 kilograms) of salt per day for 22 days, better than 16 semis, or 30 round trips per worker.

However, Robinet began with a 15% solution and let the water evaporate before he observed the separation of the opium.<sup>52</sup> Robiquet used a seven percent saline solution<sup>53</sup> so this new guesstimate could be halved except that, again, this is only what Robiquet began with. He then saturated his solution of opium with even more sea salt in powder.<sup>54</sup> Robinet, Robiquet, Pelletier and Guibourt, and the editors of the *EJMS* write that the separation of the opium takes place at saturation, at the moment when the salt begins to crystallize.<sup>55</sup>

<sup>50</sup> Hilderbrand, K. S. "Preparation of Salt Brines for the Fishing Industry," p. 3/4, <http://seagrant.oregonstate.edu/sgpubs/onlinepubs/h990002.pdf>.

<sup>51</sup> From [www.letiecq.org/gletiecq/conversions.html](http://www.letiecq.org/gletiecq/conversions.html).

<sup>52</sup> Robinet, S. "*Recherches sur l'Emploi des sels neutres dans les analyses végétales, et application de ce procédé à l'opium*," *Annales de Chimie et de Physique*. Volume 30. Paris: Chez Crochard, 1825, p. 211.

<sup>53</sup> Robiquet. "*Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium*," *Journal de Pharmacie*, vol. 12 (1826), pp. 70-71.

<sup>54</sup> Robiquet. "*Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium*," *Journal de Pharmacie*, vol. 12 (1826), pp. 70-71.

<sup>55</sup> Robinet, S. "*Recherches sur l'Emploi des sels neutres dans les analyses végétales, et application de ce procédé à l'opium*," *Annales de Chimie et de Physique*. Volume 30. Paris: Chez Crochard, 1825, p. 211: "*Dès qu'il commença à se former des cristaux de sel marin ....*" Robiquet. "*Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium*," *Journal de Pharmacie*, vol. 12. Paris: Chez Louis Colas Fils, 1826, p. 70: "*sa complète saturation*;" Pelletier, J. and Guibourt. "*Rapport de MM. Pelletier et*

A "fully saturated brine solution contains about 26.4% salt."<sup>56</sup> Calculating roughly at 25%, if Lin wants his salt to crystallize immediately, he needs some 351,000 pounds of salt *per tank* per day. Working all three tanks simultaneously, he needs more than 22 semis or 42 round trips per worker. At ten minutes per round trip from pier to tank including the inspections at the gates, it takes nearly seven hours to fill all three of the two-feet deep in water tanks with salt almost to saturation.

For a better estimate, working from the same table as before, "Sodium Chloride Brine Tables for Brine at 60 degrees F," a brine solution containing 26.395 percent salt requires 2.647 pounds of salt per gallon.<sup>57</sup> With 168,300 gallons of water in tank two, full saturation could have been achieved using 445,490.1 pounds of salt, nearly ten semitrailers or eighteen round trips per worker or three hours if every single worker was engaged in nothing but transporting salt from dockside to tank two. There is no evidence Lin followed the method of Robinet, Robiquet, Pelletier and Guibourt, or the editors of the *EJMS*. There is only Lin's evidence he observed a similar separation to that observed in European labs with fully saturated salt brines and Lin's use of *yan2 lu3*, "the bitter liquid left after the crystallization of salt from brine."<sup>58</sup>

---

*Guibourt, sur un mémoire ayant pour titre: Recherches sur l'emploi des sels neutres dans les analyses végétales et application de cette méthode à l'opium, par M. Robinet,* *Journal de Pharmacie et des Sciences Accessoires*, vol. 11. P.-J. Bouillon-Lagrange, et al., editors. Paris: Chez Louis Colas Fils, 1825, p. 370: "Au moment où le sel marin commence à se déposer ...." "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 199: "When the muriate of soda began to be deposited ...."

<sup>56</sup> Hilderbrand, K. S. "Preparation of Salt Brines for the Fishing Industry," p. 3/4, <http://seagrant.oregonstate.edu/sgpubs/onlinepubs/h990002.pdf>.

<sup>57</sup> Hilderbrand, K. S. "Table 1 - Sodium Chloride Brine Tables for Brine at 60 degrees F," from "Preparation of Salt Brines for the Fishing Industry," <http://seagrant.oregonstate.edu/sgpubs/onlinepubs/h990002.pdf>.

<sup>58</sup> See page 494, note 62.

How much lime did European chemists use? The Pelletier-Thibouméry-Mohr method uses 1 part lime to every 10 parts of water and 4 parts of opium.<sup>59</sup> Figuring by the volume of water, if every tank has 22,500 cubic feet of water then Lin needs 2,250 cubic feet of lime per tank. If he uses all three tanks every day, he needs 6,750 cubic feet of lime per day. How much would this weigh?

Quicklime (calcium oxide) is heavier than hydrated lime, weighing 55-60 pounds/cubic foot in pebble form and having a specific gravity of 3.2-3.4. Quicklime sized 1/4 inch or less typically weighs 65 pounds/cubic foot. Hydrated lime (calcium hydroxide) is rather light and bulky, having bulk densities ranging between 30 and 40 pounds/cubic foot (35 pounds/cubic foot on average). Specific gravities of high calcium hydrated lime are 2.3-2.4, and of normal dolomitic hydrated lime 2.7-2.9.<sup>60</sup>

Limestone weighs 68 pounds/cubic foot and calcium carbonate 75 pounds/cubic foot.<sup>61</sup>

Depending on the fires or kilns, Lin's "whole pieces of thoroughly heated limes" could have been a mix of limestone or shell and quicklime, weighing somewhere between 55 and 75 pounds per cubic foot. Accepting 60 pounds per cubic foot for ease of calculation, then the 2,250 cubic feet of lime that he needed to add to tank two would have weighed 135,000 pounds (61,363.6 kilograms).

Figuring by the weight of the water, and using the ratio of one to ten, lime to water, then Lin needs to add 140,400 pounds (63,818.1 kilograms) of lime per day per tank, or about three self-unloading pneumatic truckloads. Six round trips per worker carrying a 50 pound basket of quicklime from the kilns or dockside to tank two would also have accomplished the same task.

---

<sup>59</sup> Barbier (1950), p. 2; also see chapter seventeen.

<sup>60</sup> "Lime-Treated Soil Construction Manual - Lime Stabilization and Lime Modification," National Lime Association. Bulletin 326. January 2004. From [www.lime.org/Construct104.pdf](http://www.lime.org/Construct104.pdf), pp. 12/41, 30/41.

<sup>61</sup> "Table 21. Commodity storage densities and storage requirements," from "Granular Material Calculating Capacity," North Dakota State University AS-1282, [www.ag.ndsu.edu/pubs/ansci/livestoc/as1282w-2.htm](http://www.ag.ndsu.edu/pubs/ansci/livestoc/as1282w-2.htm).

Calculated by the weight of the opium, if he uses one part of lime for four parts of opium and he has 3,160,417.8 pounds (1,436,544.4 kilograms) of opium to process in total (2,376,254 catties at 1.33 pounds per catty), then had Lin followed this method he would have needed roughly 790,104.4 pounds of lime total or only about 35,914 pounds of lime per day. Using the catty as the unit of measurement, in order to melt 108,011 catties of opium daily he needs roughly 27,000 catties of lime per day for 22 days. There is no evidence Lin followed the Pelletier-Thibouméry-Mohr method.

The Solvay process uses sodium chloride and calcium carbonate to produce sodium carbonate and calcium chloride:  $2\text{NaCl} + \text{CaCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{CaCl}_2$ . Assuming Lin saturated his salt solution in tank two to achieve a separation, how much calcium carbonate would Lin have needed had he followed this method? Salt weighs 58.44 grams per mole and calcium carbonate 100.08 grams per mole.<sup>62</sup> So the proportions needed for the Solvay process are roughly 117 to 100, salt to calcium carbonate. With about 445,490 pounds of salt necessary to achieve saturation, Lin would have needed something like 380,761 pounds of limestone or shell for tank two. Lin thoroughly heats his limes, producing some proportion of quicklime from his shell or limestone depending upon the temperature of his fires or kilns and the length of time it was heated. Calcium oxide weighs 56.0794 grams per mole making the ratio of salt to lime about 117 to 56, or roughly 223,153 pounds of quicklime for tank two. There is no evidence Lin followed in any manner the proportions used in the Solvay process.

It begins to appear as if Lin will have plenty of work to go around even if he only uses one tank, not three. Just because he has three tanks does not mean Lin will be using them simultaneously. He explains to the emperor that he has two square ponds and that he may use only a single pond on any given day: "If the one pond cannot be cleaned on day A, then the other would be used on day

---

<sup>62</sup> See [www.chemcalc.org](http://www.chemcalc.org), [www.ch.ic.ac.uk/jwa/applets/f2m2f](http://www.ch.ic.ac.uk/jwa/applets/f2m2f), library, [www.saltinstitute.org/15.html](http://www.saltinstitute.org/15.html), "Toxicological Evaluation of some Antimicrobials ...," [www.inchem.org/documents/jecfa/jecmono/40abcj46.htm](http://www.inchem.org/documents/jecfa/jecmono/40abcj46.htm), and wikipedia.



B."<sup>63</sup> If this were correct, he would be filling alternate ponds on alternate days with the entire 1000 chests or 100,000 catties. Bridgman sees rectangular pond two being filled with opium while pond number one is being filled with water and pond number three is waiting to be discharged.<sup>64</sup> He arrives at 11 a.m. so pond three could have been filled with opium, salt and lime that morning while pond one was being discharged and cleaned. But this would have meant a very early start as Lin says he waits half a day before he adds the lime. Tank three may have been sitting overnight while Lin waits for the tide to change. As has been seen, depending on the quantities of salt used, it may have taken a good half day just to add the salt if he had been using all three tanks simultaneously. Against this, Bridgman does not notice any forms on tanks one and three.

Using only one tank per day for mixing, Lin can still keep his hired workers busy during the long summer daylight hours. This fits with the scenario he explains to the emperor and with Bridgman's basic observations. The mixing tank will take hours to fill if he wants a saturated salt brine. The opium soaks for half a day and separates into a floating oil and sinking sifting. The tank in a state of slow decomposition that he used the previous day still needs to be discharged, washed, cleaned and the residue collected from the filter. Lin tells the emperor he doesn't work at night<sup>65</sup> and only sluices the liquid out from the ponds depending on the receding tide. His workers still have to spread the lime over the mixing tank. The first tank needs to be filled with water. Even if he mixes in only one pond per day his 500 hired workers<sup>66</sup> are not going to be sitting around very much, avoiding an unhappy, expensive and dangerous jobsite. Depending upon the proportions of salt, opium and lime, using only one tank per day, he may have been able to keep everyone busy running back and forth filling, hauling and dumping,

---

<sup>63</sup> Kuo, p. 246.

<sup>64</sup> *CR*, vol. 8, pp. 73-74 (MD).

<sup>65</sup> Kuo, p. 246.

<sup>66</sup> Kuo, p. 246.

plowing, settling, filtering and cleaning and still accomplish his task.

Does Lin need to mix in all three tanks simultaneously? The answer would depend upon the proportion of opium to water he could put in any given tank. How dilute or concentrated was Lin's solution? Lin tells the emperor he destroyed 2,376,254 catties of opium by 25 June 1839. If a catty is 1.33 pounds, then Lin soaked 3,160,417.8 pounds of opium in a mix of water, lime and sea salt. Figured by the weight of the water in each tank, each one of the 22,500 cubic feet of water weighs 62.4 pounds giving 1,404,000 pounds (638,181 kilograms) of water. How much opium could he soak in this much water?

Suppose Lin had used Derosne's proportion of one to ten, opium to water. This would have deviated from the Pelletier-Thiboumery-Mohr ratio of four to ten, opium to water. Heumann used a ratio of one to five, opium to water. Robinet soaks his opium in a salt brine at a ratio of one to six and then one to four.<sup>67</sup> S. E. Asian field chemists add 10-15 kilograms of opium to 30 gallons of water, a ratio of approximately one to ten. If Lin had chosen this more dilute ratio, then in a single tank he would have soaked about 140,400 pounds of opium, roughly the weight of 1000 chests at 100 catties per chest at 1.33 pounds per catty or 133,000 pounds if all of the opium had been Malwa.<sup>68</sup> He has 3,160,417.8 pounds of opium to process. By mixing in only one tank an average of 140,400 pounds of opium per day, 22 days of work would process 3,132,800 pounds of opium. In fact, Lin had the ability to process all of the foreign opium using lime and salt in 22 days with only two feet of water in only one large tank.

---

<sup>67</sup> Derosne (1803), pp. 260-261; Barbier (1950), p. 2; Heumann (1957), p. 4; Robinet (1825), pp. 210-211.

<sup>68</sup> DEA 20026, p. 10. Only about two thirds was Malwa and one third Bengal packed in 149 lb. chests.

## H. COMMUNICATIONS

Lin must communicate with the emperor in order to retain his support. But like every good employee he doesn't tell his boss everything at every moment, for fear of meddling. Lin doesn't inform the emperor of his new method until he is halfway completed and the letter does not arrive in Peking until long after he is done.<sup>69</sup> This is true unless he informed the emperor immediately of his public pronouncement of about 31 May containing a bare bones description of his proposal to use salt and lime and trenches. Waley writes that he drafted his proposal for transporting the opium by sea to Peking on 28 May but did not communicate again until mid June: "His next report to Peking arrived on July 8th and seems to have been sent on June 13th."<sup>70</sup> Chang also does not record any other dispatches during the latter part of May and the first two weeks of June from Lin to the emperor.<sup>71</sup> Effectively, Lin presents the emperor with a *fait accompli*.

Dr. Chang disputes this: "With regard to the disposal of the confiscated opium, the use of fire-boat tactics to drive off (or destroy) illicit foreign ships, and other radical measures, the commissioner cautiously requested imperial instructions and approval in advance."<sup>72</sup> But both Chang and Waley admit that Lin's suggestion in mid April to the emperor that the opium be sent to Peking to be burned was only a courtesy and not meant to be taken seriously.<sup>73</sup> So it was with Lin's suggestion in late May that the opium be sent to Peking by sea, a proposal that was never sent.<sup>74</sup> Nor is there any record of any memorial requesting the emperor's permission to dispose of the opium with salt and lime or even notifying him beforehand of this new method. In fact, the idea is Lin's and he does not appear to wish it second-guessed by the emperor.

---

<sup>69</sup> Chang, p. 174; Waley, p. 47.

<sup>70</sup> Waley, pp. 46-47.

<sup>71</sup> Chang, pp. 173-174.

<sup>72</sup> Chang, p. 121.

<sup>73</sup> Waley, p. 45; Chang, p. 173.

<sup>74</sup> Waley, p. 46.

He must know how long it will take him, before he begins. A work of this magnitude requires a great deal of planning beforehand, not simply labor. Sometime between 12 April, the day after he begins to receive it (when he suggests the emperor burn it in Beijing) and 13 May when he inspects the trenches, he has planned the entire operation completely. Since he was already receiving it on 12 April, he had to have at least begun site preparation and storage facility construction by this date. He began his curious processing of the opium only a month and a half later, on 3 June 1839 and finished 25 June. If we except 15 June as a holiday, he is finished with the foreign opium in 22 days.<sup>75</sup>

He must believe the emperor will reject his initial idea of transferring it to Peking. There had been a precedent, "an imperial order of the previous year which turned down a suggestion to transfer to Peking opium seized in the various provinces from native holders."<sup>76</sup> Perhaps he had a good idea that someone would point out the infeasibility of the transfer even if the emperor initially agreed. The person who does object is "Teng Ying, a censor of the Chekiang circuit."<sup>77</sup> Lin had been intendant and salt controller in Chekiang from 1819 to 1823.<sup>78</sup>

While in Peking, Lin is "admitted to imperial audience nineteen times."<sup>79</sup> Perhaps he has a rough idea of the character of the emperor and knows just how much or how little it takes to change his mind. Chang notices the emperor's "sudden change" in attitude and policy in 1840, for example.<sup>80</sup> The emperor consents to Lin's original plan to send the opium to Peking the day he receives Lin's letter, 2 May.<sup>81</sup> The emperor then reverses himself the day he receives the letter from Teng Ying, or the day after, because his letter to Lin could not have arrived by the 29th otherwise.

---

<sup>75</sup> Chang, pp. 173-175.

<sup>76</sup> Chang, p. 173.

<sup>77</sup> Chang, p. 172.

<sup>78</sup> Chang, pp. 121-122.

<sup>79</sup> Chang, p. 120; Hummel, p. 511 (Q).

<sup>80</sup> Chang, pp. 210-213.

<sup>81</sup> Chang, p. 172.

This is because by an absurd coincidence, during this period it takes roughly 21-22 days for a letter to go from Peking to Canton or from Canton to Peking.<sup>82</sup> This suggests that Lin can plan, organize, prepare the site, and complete the job in the time it takes the emperor to reverse himself again. He inspects his trenches on 13 May and finishes with the foreign opium 44 days later on 25 June. Disputing the transit time is Waley, who notes that during the war, one of Lin's dispatches from Canton does not arrive in Peking for thirty-three days: "An express message by relay riders should not have taken more than eighteen days."<sup>83</sup>

Lin states in the memorial sent 12 April from Canton that "I order that the present memorial be conveyed to Peking with particular haste - at the speed of 400 li a day."<sup>84</sup> Kuo dates this same memorial "May 2, 1839" by the date it was received in Beijing.<sup>85</sup> Disputing this is Slade (1839) who adds a note to Lin's edict of 31 May that an express rider traveled 600 *le* per day.<sup>86</sup> No matter how fast the dispatch goes by relay rider, the time it takes to arrive is roughly the same between Canton and Beijing for the memorials from Lin to the emperor or the edicts from the emperor to Lin during this period. The dates can be checked and rechecked between Waley, Chang and Kuo; around the summer of 1839 the dispatches arrive from either direction in roughly 21-22 days.<sup>87</sup>

The distance between Canton and Peking is about 1200 miles and at 3 li to the mile, 3600 li; at 3 and one-half li to the mile, 4200 li. A rate of 400 li per day means Lin's memorial of 12 April should have arrived between 9 and 11 days later, between 21 April and 23 April, according to Kuo's dating procedure. If Slade is correct, it would have arrived in six to seven days.

But 1200 miles is air-travel distance. The *li* was measured on the ground by the feet of the twenty bearers who carried Lin's

---

<sup>82</sup> Chang, pp. 172, 174; Waley, pp. 53, 67, 84; Kuo, pp. 217, 244, 248, 252.

<sup>83</sup> Fay, p. 123, footnote 2.

<sup>84</sup> Kuo, p. 242.

<sup>85</sup> Kuo, p. 237.

<sup>86</sup> Slade, p. 110 (GB).

<sup>87</sup> Chang, pp. 172, 174; Waley, pp. 53, 67, 84; Kuo, pp. 217, 244, 248, 252.

private litter down from Peking.<sup>88</sup> The journey was much longer in 1839. Lin leaves Peking on 8 January 1839 and does not arrive until two months later, on 10 March, after a trip beset with violent winds and snowstorms, boats covered in ice, steep rapids and mountain passes.<sup>89</sup> At 400 li per day, the distance overland from Canton to Peking would have been 8800 li; at 600 li per day, 13,200 li. By comparison with Lin's journey, the rate of 22 days for official dispatches would have been seen as a considerable improvement over Lin's 62 day journey.

On the other hand, why he chooses to do the job in 22 days could be something as simple as his initial estimate of 22 ships and 1000 chests per ship.<sup>90</sup> He inspects the trenches eleven days before he receives the emperor's reply to his first suggestion and a week before all of the opium has been received.<sup>91</sup> So he could be designing his trenches based on his initial estimates. He tells the emperor on 12 April that Elliot states the English have on their store-ships, 20,283 chests and Lin believes this to be true because

as we learn from experienced sailors and merchants, the largest storeships of the barbarians can contain little more than one thousand chests each. The total amount of twenty-two ships thus would not be far different from what has been reported by Elliot.<sup>92</sup>

He estimates a net weight per chest of "more than 100 catties" for a total of "no less than two and odd million catties."<sup>93</sup> His estimate is very close, since by more than two to one, the chests probably contained Malwa opium from northeast India which had "adopted the Chinese picul weight (a picul weighing 133 and one-third lb.) which was more convenient for Chinese counting than the two-factory-maunds (weighing 149 lb.) Bengal chest."<sup>94</sup> One picul of

---

<sup>88</sup> Waley, p. 15.

<sup>89</sup> Waley, pp. 14-20.

<sup>90</sup> Kuo, pp. 240-241.

<sup>91</sup> Chang, p. 171, 173; Waley, p. 45.

<sup>92</sup> Kuo, pp. 240-241.

<sup>93</sup> Kuo, p. 240.

<sup>94</sup> Chung, p. 85.

course equals 100 catties.<sup>95</sup> He tells the emperor afterwards that he destroyed exactly a net weight of 2,376,254 catties total contained in "19,179 chests and 2119 bags."<sup>96</sup> If he works off 100,000 catties or about 1000 chests per day, in 22 days he can finish with the lot. He could of course have taken much longer with the work.

The coincidence in work time and letter travel time may just be that. What is clear is that Lin knows he will finish and probably intends to finish long before the emperor will have time to object. This new process using salt and lime is Lin's idea, not the emperor's. Lin does not ask the emperor either for instructions or approval. In this he exhibits a great deal of confidence that the emperor is not receiving some other, more trusted, backchannel information about his work there in Canton. But without a better understanding of the intricacies of late Ch'ing mandarin politics, it is impossible to formulate an intelligent supposition on this minor point.

## I. FUNDING

And just who is going to pay for all this? Lin's father was "a needy scholar, who never attained to any official position" writes Waley.<sup>97</sup> Chang says, "Although his family had produced many prominent statesmen in the Ming dynasty, his immediate forefathers were not particularly renowned, his father being an obscure teacher."<sup>98</sup> He is not getting paid for this. On his trip down from Peking, he hires his own bearers, wagons, drivers, even the occasional boat and crew.<sup>99</sup>

Lin is clearly able to convince someone to call out the navy to protect his site and hand-pick officers to supervise the operation. He has the emperor's explicit instructions for this. But who hires the 500 workers per day for 22 days he needs to process his opium? Lin

---

<sup>95</sup> Chang, p. xvi.

<sup>96</sup> Kuo, p. 250.

<sup>97</sup> Waley, p. 12.

<sup>98</sup> Chang, p. 121.

<sup>99</sup> Waley, pp. 14-15.

twice mentions the "hired" laborers.<sup>100</sup> And who pays for the good two month's worth of labor needed to prepare the site beforehand? Who rents all the oxcarts and oxen and pays all the oxcart drivers? Who rents all the boats needed to transport the dirt, bamboo, salt and lime? Who buys the lime and the salt for this rumless opium daiquiri? And just what do they expect to get back for their investment?

As well, Lin proposes to the emperor to reimburse the barbarians "five catties of tea" for every chest of opium, or roughly 100,000 catties of tea (133,333 pounds): "Should this proposition receive your Imperial approval, the tea needed will be contributed by us, not to be charged on the Treasury."<sup>101</sup> Someone is going to have to buy this tea, worth in 1834-1835 somewhere between 29,000 and 39,000 Spanish dollars or roughly half the value of the green tea or one-eighth the value of the black tea exported by the British at Canton in that entire fiscal year.<sup>102</sup> The tea is never delivered.

## J. DISCUSSION AND QUESTIONS

Lin understands large projects. The immense amount of management and organization of the job does not dissuade him. He must prepare and secure his site, its perimeter strongly impaled with bamboo like a "Malayan camp." Lin has to provide for the storage of his recently acquired opium and see that his workers are fed, clothed and housed. He must excavate a football field so that a basketball center standing in one of his tanks cannot see over the rim. He must transport small mountains of salt and lime. He does not want his job interfered with by meddling higher-ups so he does not tell them exactly what he is doing until it is too late to complain. It is not clear who is paying for this boy's own chemistry set on steroids. No doubt either Merck or Morson would have been astounded to have witnessed such a feat.

---

<sup>100</sup> Kuo, p. 246.

<sup>101</sup> Kuo, p. 242.

<sup>102</sup> Chang, p. 225.



Even if the previous estimates are well off the mark, the scale and organization of this endeavor must begin to become clear. Lin's process is logistically complex, time-consuming, and expensive. If he destroys the opium, he receives zero return on his investment.

Why doesn't Lin just light a match? He was going to do just that on 18 March. He was happy with that method before he arrived at Canton. This seemed to be the plan in the first letter to the queen. As late as 12 April he is proposing the emperor burn it in Peking. He tells the queen of a foreign country in the second letter that that is what he did. Instead, this son of a poor schoolteacher without enough government funding to pay for his own transport south embarks on a massive pharonic operation when a simpler, cheaper method existed to accomplish his stated aims. The ostensible reason given for this non-trivial construction project is that he must go to these lengths because the purifiers can later dig out some burned opium and get 20-30 percent of its value? It is fair to question the motivation for such a large project.

And why does Lin select the very method by which the alkaloids of opium can be extracted? On the one hand the purifiers demonstrate the method with salt and lime in one of their pans. Lin tells the emperor that this phenomenal project is there to replace the thousands of pans that would be needed, otherwise. In essence, Lin has created three very large, commercial scale pans for the purifiers. Lin writes to the emperor that he will use lime and salt to destroy the confiscated opium in his super-sized pans that have required him at least a month and probably two to plan and build. The purifiers know how *not* to add salt and lime in their process of purification. The 19th century European chemists know how to extract the alkaloids from opium using lime and salt in their pans. Is there any connection here between the extractable alkaloids from opium and some compensation for all this effort?

## XXIII THE RECIPE

---

- XXIII. THE RECIPE
- A. LIN'S RECIPE
    - 1. SALT AND OPIUM
    - 2. LIME AND OPIUM
    - 3. SALT AND LIME
    - 4. SALT, LIME AND OPIUM
    - 5. TANK CONSTRUCTION AND SETTLING
  - B. BRIDGMAN'S RECIPE
  - C. THE DEA'S RECIPE
  - D. DISCUSSION AND QUESTIONS

At this point Lin has the knowledge, ingredients and equipment. All he lacks is a recipe. There are three possibilities for how he used his ingredients. He could have added salt first and then lime, the salt and lime together or the lime first and then the salt. To give these three methods names, the first is that of Lin as told to the emperor, the second is that of Bridgman as told to the readers of the *Chinese Repository*, and the third is that of unnamed Southeast Asian field chemists as anonymously reported by the DEA, with the ammonium chloride substituted by sodium chloride.

He also had two possibilities for how he used his equipment. The tanks could have been used independently of one another or they could have been interconnected. Beyond this, there are variations possible in the amounts and proportions of the ingredients and the duration of the settling time which would have affected the result.

## A. LIN'S RECIPE

What Lin says he did with his ingredients and equipment was written down in two memorials to the emperor. Lin's recipe as told to the emperor has two parts: first, the opium is soaked in a salt brine for half a day; only then is lime added. Each combination of these basic ingredients can be considered separately. Afterwards, this mixture is allowed to settle. Bridgman observed the liquid portion was filtered before being sluiced into the river.

## 1. SALT AND OPIUM

In his first memorial to the emperor on the subject, P. C. Kuo translates Lin's description of the first part of his process (*italics added*):

As to the process of destruction, water is first conveyed into the ponds through the aqueduct; *then salt is made to dissolve in the water; the opium, each piece broken into four parts, is thereupon thrown into the salt water to stay there for half a day.*<sup>1</sup>

A number of 19th century European chemists also experimented with opium in salt solutions, most notably Robinet, Robiquet, Pelletier and Guibourt. Robinet's purpose was to reduce "to a very small number those agents that can be employed in vegetable analysis without exercising upon them some elementary affinity which would change their nature."<sup>2</sup> Like Lin, Robinet began with a solution of sea salt (*sel marin*), opium and cold water. He cut

---

<sup>1</sup> Kuo, p. 246.

<sup>2</sup> Pelletier and Guibourt. "*Rapport de MM. Pelletier et Guibourt, sur un mémoire ayant pour titre: Recherches sur l'emploi des sels neutres dans les analyses végétales et application de cette méthode à l'opium, par M. Robinet,*" *Journal de Pharmacie et des Sciences Accessoires*, vol. 11. P.-J. Bouillon-Lagrange, et al., editors. Paris: Chez Louis Colas Fils, 1825, p. 366. Originally, *réduit à un très-petit nombre ceux de ces agens qu'on peut employer dans l'analyse végétale pour séparer les principes immédiats sans exercer sur eux d'affinité élémentaire qui changerait leur nature.*

the opium into pieces and stirred the liquid to help it dissolve. Lin also has his hired workers "stir inside the pond with their plows."<sup>3</sup> Agitation of the salt solution would have been necessary as it "greatly increases the rate at which salt dissolves. A layer of salt on the bottom of a tank may take days to dissolve if left undisturbed."<sup>4</sup>

In his experiment Robinet simply let the solution evaporate. As the water evaporated, the salt began to crystalize (italics added): "*At the same time as there began to be formed some crystals of sea salt, he observed a brown substance, fluid and resinous, swimming on the surface of the liquid, having been dissolved in totality in the water.*"<sup>5</sup> Pelletier and Guibourt observed the morphine floating in the oil (italics added):

M. Robinet treats the opium at the ordinary temperature of the atmosphere in two stages, the first by a solution of sea salt at 15 [degrees] density, in the proportion of six parts of solution against one part of opium, in the second by four parts of solution. The filtered liquors are then evaporated. *At the moment when the sea salt begins to be deposited one sees a brown oily matter floating. This is the combination of the morphine contained in the opium with the acid which saturates it.* It is possible to draw it off at this point; but it is preferable to evaporate the liquid in order to obtain all the material that is held in solution and which is presented in the form of a saline mass.<sup>6</sup>

<sup>3</sup> Kuo, p. 246.

<sup>4</sup> Hilderbrand, K. S. "Preparation of Salt Brines for the Fishing Industry," Oregon State University, 1998 found at <http://seagrant.oregonstate.edu/sjpgpubs/onlinepubs/h99002.pdf>, p. 4.

<sup>5</sup> Robinet, S. *ACP*, vol. 30, p. 211, italics Robinet for *sel de morphine*. Originally, *Dès qu'il commença à se former des cristaux de sel marin, on vit en même temps une substance brune, fluide et comme résineuse, surnager à la surface du liquide, pouvant se dissoudre en totalité dans l'eau.*

<sup>6</sup> Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, p. 370. Originally, *M. Robinet traite l'opium à deux reprises par une solution de sel marin à 15 [degrees] de densité, dans la proportion de six parties de solution contre une d'opium pour la première fois, et quatre parties pour la seconde à la température ordinaire de l'atmosphère. Les liqueurs filtrées sont alors mises à évaporer. Au moment où le sel marin commence à se déposer on voit surnager une matière brune huileuse. C'est la combinaison de la morphine contenue dans l'opium avec l'acide qui la sature. On pourrait dès lors l'enlever; mais il est préférable d'évaporer le liquide pour obtenir*

Robiquet repeated Robinet's experiment with opium in a brine solution but he varied some of the inputs that he didn't feel were important (*italics added*):

I macerated a kilogram of opium in a sufficient quantity of water, and after having returned all the reunited solutions to around 7 [degrees] of the aerometer, I added to it *sea salt* in powder, and I stirred the liquid until it was completely *saturated*. After some moments of contact, I saw *a sticky black material which was precipitated abundantly and which plastered all the inner walls of the flask*.<sup>7</sup>

These experiences of 1825-1826 in Paris can be compared with Lin's observation at Canton in 1839 (*italics added*): "At the time of dissolving, *the thick oily part floats on the surface*, while the siftings sink down."<sup>8</sup>

Is it Lin's sea salt alone that produces this phenomenon? Many substances can produce separations and precipitations. Lin describes the process to the emperor as "dissolving, mixing, melting and stirring" (*italics added*):

salt is made to *dissolve* in the water; the opium ... is then thrown into the salt water to stay there for half a day; and finally whole pieces of thoroughly heated limes are thrown into the mixture. ... Meantime, a number of laborers are hired to *stir* inside the pond with their plows ...<sup>9</sup>

---

*toutes les matières qu'il tenait en dissolution et qui se présentent sous forme de masse saline.*

<sup>7</sup> Robiquet. "Osservations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*, vol. 12 (1826), p. 70. Originally, *Je fis macérer un kilogramme d'opium dans une quantité suffisante d'eau, et après avoir ramené toutes les solutions réunies à environ 7 [degrees] de l'aréomètre, j'y ajoutai du sel marin en poudre, et j'agitai le liquide jusqu'à sa complète saturation. Après quelques instans de contact, je vis une matière poisseuse noirâtre qui se précipita en assez grande abondance, et qui vint enduire toutes les parois internes du vase.*

<sup>8</sup> Kuo, p. 246.

<sup>9</sup> Kuo, p. 246.

In this first memorial (received in Peking 8 July 1839), Lin explains that it is the dissolving that produces the separation (*italics added*): "*At the time of dissolving*, the thick oily part floats on the surface, while the siftings sink down."<sup>10</sup> The salt dissolves the opium while the lime melts it. Robinet lets his solution evaporate; it is unclear how much evaporation is taking place at Lin's pond on a hot day in June.

On the other hand, Lin tells the emperor in the second memorial (received 28 July 1839 in Peking) it is not the salt which dissolves the opium but the lime (*italics added*): "Since that time we have followed the same method of first breaking the chests, then weighing the opium, then cutting it into pieces, and finally throwing it into the pond to be mixed with salt water and *dissolved by lime*."<sup>11</sup> This is Kuo's translation. But then later in the same memorial Lin tells the emperor of the arrival of the barbarians (*italics added*): "Therefore we sent officers to escort them to the ponds and let them fully acquaint themselves with the methods of *cutting opium, dissolving, melting, and destroying it*."<sup>12</sup> This repeats the sequence given in the first memorial where the salt dissolves and the lime melts. In Kuo's translation of the second memorial there seems to be a discrepancy as to whether it is the salt doing the dissolving or the lime. If the lime is now doing the dissolving, what is the salt doing?

Depending upon the proportion of salt, water and opium, this first part of Lin's process would have exhibited some interesting chemical combinations. The separation of the opium into two parts by the salt brine was not completely mechanical as Robinet and other chemists had originally thought. Instead, it resulted in an exchange of bases or double decomposition between the salt (sodium chloride) and the morphine meconate, the sodium combining with the meconic acid and the morphine with the chloride. This yielded a sodium meconate and a morphine chloride, the latter becoming in the presence of the water a morphine hydrochloride, as explained by

---

<sup>10</sup> Kuo, p. 246.

<sup>11</sup> Kuo, p. 248.

<sup>12</sup> Kuo, p. 249.

number of reviewers.<sup>13</sup> This, of course, happened after considerable evaporation and saturation.

The editors of the *EJMS* found evidence of the action of hydrochloric acid but did not know where it had come from: "These tests were sufficient to convince us that muriatic acid was present in the salt we had procured ... but we were undecided as to its origin ...."<sup>14</sup> Robiquet, on the other hand, knew it had to be derived from the salt (*italics added*):

[I]t was only after the complete purification that I could state its true nature and recognize that it was a muriate of morphine. *It would be impossible to understand this result without admitting that the hydrochloric acid had been furnished by the sea salt.* ... I find myself authorized by the preceding facts to consider provisionally the *codeate of morphine* as a true *muriate*.<sup>15</sup>

---

<sup>13</sup> "Analyse des travaux du troisième trimestre de 1825," *Journal de Pharmacie et des Sciences Accessoires*. Vol. 11. Paris: Chez Louis Fils, 1825, pp. 471-472 (GB); "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, pp. 201-202 (GB); Robiquet. "Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*, vol. 12 (1826), pp. 71, 73; Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, pp. 371-374.

<sup>14</sup> "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science*. Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, p. 202 (GB).

<sup>15</sup> Robiquet. "Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*, vol. 12 (1826), pp. 71, 73. Originally, *mais ce ne fut qu'après la complète purification que je pus constater sa véritable nature et reconnaître que c'était un muriate de morphine. Il me fut impossible de me rendre compte de ce résultat sans admettre que l'acide hydrochlorique avait été fourni par le sel marin ... je me trouve autorisé par les faits précédents à regarder provisoirement le codéate de morphine comme un véritable muriate.* *Italics Robiquet for codeate of morphine and muriate (codéate de morphine and muriate).*

The editors of the *JPS* placed the experiments within a general framework (*italics added*):

[T]he attempted analysis by saline solutions is not at all mechanical, as had been thought. It offers on the contrary some examples of *double decomposition or exchange of bases* .... M. Robiquet, repeating the analysis of opium with saline solutions obtained ... a grainy precipitate which, purified and examined, was recognized as a *muriate of morphine*. *The hydrochloric acid could only have been furnished by the sea salt*. ... M. Robiquet ... also thinks that the meconate of soda announced by M. Robinet resulted from an *exchange of bases*, which happens frequently in complex combinations. ... Our colleague Pelletier has also recognized a *muriate of morphine* in the supposed codeate.<sup>16</sup>

It was from the liquid, obtained after the separation produced by saturating his opium solution with salt, that Robiquet precipitated his morphine with ammonia:

After the action had completely terminated, I filtered the liquor and submitted it to boiling. When it had arrived at this temperature, I added a convenient quantity of ammonia ... and I obtained hardly four grams of morphine. I then returned to the solution of opium previously precipitated by the sea salt ... but it was only after complete purification when I could state its true nature and recognize that it was a muriate of morphine.<sup>17</sup>

---

<sup>16</sup> "Analyse des travaux du troisième trimestre de 1825," *Journal de Pharmacie et des Sciences Accessoires*. Vol. 11. Paris: Chez Louis Fils, 1825, pp. 471-472 (GB). Originally, *l'analyse tentée par les solutions salines n'est point mécanique, ainsi qu'on le pensait; elle offre au contraire des exemples de doubles décompositions ou d'échanges de bases*. ... M. Robiquet, répétant l'analyse de l'opium au moyen des solutions salines, obtint ... un précipité grenu qui, purifié et examiné, fut reconnu pour du muriate de morphine. L'acide hydrochlorique n'avait pu être fourni que par le sel marin. ... M. Robiquet ... pense également que le méconate de soude annoncé par M. Robinet résulte d'un échange de bases, ce qui arrive fréquemment dans les combinaisons complexes. ... Notre confrère Pelletier avait aussi reconnu un muriate de morphine dans le prétendu codéate ....

<sup>17</sup> Robiquet. *JPS*, vol. 12 (1826), pp. 70-71. Originally, *Lorsque l'action fut entièrement terminée, on filtra la liqueur et on la soumit à l'ébullition. Arrivé à ce point, je versai une quantité convenable d'ammoniaque ... et j'obtins à*



So salt, water and opium will by themselves and under the right conditions (saturation) separate the opium into two parts, a sinking precipitate and a floating oil which contains much of the morphine. Which asks why Lin bothers to add the lime because if he had simply discarded the liquid at this point, he would have rid the opium of much of its morphine.

## 2. LIME AND OPIUM

After the opium has been soaking in the salt brine for half a day, Lin describes the second stage of his process for the emperor (*italics added*): "(F)inally *whole pieces of thoroughly heated limes are thrown into the mixture*."<sup>18</sup>

Ignoring the salt for a moment, investigators in three different centuries have reported what happens when lime is added to a solution of water and opium. Séguin (Courtois) found that lime forms insoluble salts with what came to be known as meconic acid (*italics added*):

That strontia, baryta and *lime*, which form with the acid of opium some *insoluble salts*, have more affinity with this acid than does the crystalline substance, and it is for this reason that, when one adds to the watery solution of opium the waters of baryta, strontia or *lime*, *one has a precipitate mixed with the crystalline substance*, and *an insoluble salt* formed by the combination of the acid of opium with the strontia, baryta or the *lime*.<sup>19</sup>

---

*peine 4 grammes de morphine. Je revins donc à la solution d'opium primitivement précipitée par le sel marin ... mais ce ne fut qu'après la complète purification que je pus constater sa véritable nature et reconnaître que c'était un muriate de morphine.*

<sup>18</sup> Kuo, p. 246.

<sup>19</sup> Séguin, *Annales de Chimie*, vol. 92, pp. 232-233. Originally, *Que la strontiane, la baryte et la chaux, qui forment avec l'acide de l'opium des sels insolubles, ont plus d'affinité avec cet acide que n'en a la substance cristalline, et que c'est pour cela que, quand on verse dans la dissolution aqueuse d'opium de l'eau de baryte, de strontiane ou de chaux, on a un précipité mélangé de substance cristalline, et de sel insoluble formé par la combinaison de l'acide de l'opium avec la strontiane, la baryte ou la chaux.*

Sertuerner combined his new meconic acid with lime (*italics added*):

Only as it were in passing I glance at an acid salt which it describes with *lime*: it crystallizes in prisms, is hardly soluble and seems not to fully decompose with sulfuric acid, showing thus the great affinity the meconic acid has for the *lime*, and generally that this acid possesses great strength.<sup>20</sup>

Robiquet, like many other chemists, had doubts regarding the action of alkalis like ammonia on opium so he also tried a precipitation by using a different alkaline earth metal, magnesia:

*I chose by preference magnesia, which perfectly succeeded; by its intermediation one obtains morphine nearly without color from the first crystallization.*<sup>21</sup>

Tilloy substituted lime for the magnesia (*italics added*):

According to M. Tilloy, one can use the sub-carbonate of soda (in order to saturate the excess of acid and to economize the calcined magnesia) or even the sub-carbonate of magnesia or that of *lime*.<sup>22</sup>

<sup>20</sup> Sertuerner. "Ueber das Morprium," *Annalen der Physik*, ed. L. W. Gilbert. Volume 55. Leipzig: Joh. Ambrosius Barth, 1817, p. 74. Originally, *Nur gleichsam im Vorbeigehen sah ich ein saures Salz, welches sie mit Kalk darstellt: es krystallisirt in Prismen, ist schwer auflöslich, und scheint von der Schwefelsäure nicht völlig zersetzt zu werden, zeigt also eine sehr grosse Neigung der Mekonsäure zum Kalke an, so wie überhaupt diese Säure eine grosse Mächtigkeit besitzt.* Rose has: "I only combined it with lime: it then formed an acid salt. The meconate of lime crystallizes in prisms; it is little soluble and is not decomposed by sulfuric acid." Originally, *Je ne l'ai combiné qu'avec la chaux: alor il forme un sel acide. La méconate de chaux cristallise en prismes: il est peu soluble et n'est pas décomposé par l'acide sulfurique.* *Annales de Chimie et de Physique*, eds. Gay-Lussac and Arago. Volume 5. Paris: Chez Crochard, 1817, pp. 31-32.

<sup>21</sup> Robiquet. *ACP*, vol. 5, p. 279. Originally, *je choisis de préférence la magnésie, qui m'a parfaitement réussi: par son intermède, on obtient la morphine presque incolore dès la première cristallisation.*

<sup>22</sup> Robiquet, "Section de Pharmacie," *Journal de Chimie, Médicale, de Pharmacie et de Toxicologie*, vol. 3. Paris: Chez Béchot Jeune, 1827, pp. 97-

Vogel also precipitated with lime (*italics added*):

In place of ammonia, I used ammonia carbonate in crystal. I also used *lime* and baryta. But a part of these earths is precipitated with the morphine along with a large quantity of coloring matter, making it harder to purify the morphine with alcohol.<sup>23</sup>

Robinet found that morphine was soluble in a lime solution (*italics added*):

It is well known that an excess of ammonia or of potash redissolves morphine. M. Robinet has demonstrated that the solubility of morphine in the alkalis was greater than had been thought; that this solubility extends to baryta and to *lime*; that some of these combinations crystallize ....<sup>24</sup>

Henry tried quicklime (*italics added*): "M. Henry has also tried using *quicklime* in the treatment of opium in order to separate the morphine (*in place of magnesia or ammonia*)."<sup>25</sup> Merck

---

98 (GB). Originally, *Suivant M. Tilloy, on pourrait employer le sous-carbonate de soude pour saturer l'excès d'acide et économiser la magnésie calcinée, ou encore le sous-carbonate de magnésie ou celui de chaux.*

<sup>23</sup> Vogel. "Expériences sur la Morphine et l'Acide Méconique," *Journal de Pharmacie*. Vol. 3. Paris: Chez L. Colas, 1817, p. 448 (GB). Originally, *Au lieu d'ammoniaque, je me suis servi de carbonate d'ammoniaque en cristaux; j'ai également employé la chaux et la baryte; mais une partie de ces terres se précipite avec la morphine et entraîne une trop grande quantité de matière colorante; de sorte que l'on a plus de peine à purifier la morphine par l'alcool.*

<sup>24</sup> Pelletier and Guibourt. *Journal de Pharmacie et des Sciences Accessoires*, vol. 11, p. 376. Originally, *On savait bien qu'un excès d'ammoniaque ou de potasse redissolvait la morphine. M. Robinet a montré que la solubilité de la morphine dans les alcalis était plus grande qu'on ne l'avait pensé: que cette solubilité s'étendait à la baryte et la chaux; que quelques-unes de ces combinaisons cristallisent ....*

<sup>25</sup> Bouillon-Lagrange, P.-J., et al, editors. "Section de Pharmacie," *Journal de Pharmacie et des Sciences Accessoires*, vol. 13. Paris: Chez Louis Colas, 1827, p. 24; found at <http://gallica.bnf.fr>. Originally, *M. Henry avait aussi essayé l'emploi de la chaux vive dans le traitement de l'opium pour séparer la morphine (au lieu de la magnésie ou de l'ammoniaque).*

experimented with a lime process similar to that of Pelletier-Thibouméry-Mohr (*italics added*):

The process of Merck is founded on the insolubility of morphia in a solution of sal ammoniac, *and its solubility in lime water*. Opium is to be digested in three times its weight of water, then expressed, and then repeated three or four times; these solutions being mixed are brought to a boil, and *milk of lime added in slight excess ....*<sup>26</sup>

The first part of the Pelletier-Thibouméry-Mohr process uses boiling milk of lime (calcium hydroxide):<sup>27</sup>

The liquids are united, raised to the boiling point, and mixed with an equal bulk of *milk of lime*, the latter containing a quantity of *hydrate of lime* equal to about one-fourth of the weight of the dry opium employed. After boiling for a few minutes the mixture is strained through linen; all the narcotine, meconic acid, &c., remain in the lime precipitate, while all the morphine is contained in the solution in combination with the *lime*.<sup>28</sup>

Heumann (1957) purifies his morphine with lime (*italics added*):

The slightly humid raw morphine is mixed in an open stirring vessel with four times its weight of water, and *slaked lime* is added .... The solution now contains all the morphine as calcium morphinate and is filtered off by vacuum on a Buchner filter. The residue on the filter, a mixture of *lime*, impurities and maybe some calcium meconate, is washed free of morphine and then discarded.<sup>29</sup>

Southeast Asian field chemists use lime and the DEA's observer explains why (*italics added*):

---

<sup>26</sup> Kane, Robert. *Elements of Chemistry*. Dublin: Hodges and Smith, 1842, p. 1061 (GB). Sal ammoniac was an early name used for ammonium chloride.

<sup>27</sup> Barbier, p. 2; Graham, Thomas. *Elements of Chemistry*. Part 3 - Organic Chemistry. London: Hippolyte Bailliere, 1842, p. 977 (GB).

<sup>28</sup> Graham, Thomas. *Elements of Chemistry*. Part 3 - Organic Chemistry. London: Hippolyte Bailliere, 1842, p. 977 (GB).

<sup>29</sup> Heumann, p. 7.

The process of extracting morphine from opium involves dissolving opium in boiling water, adding *lime* (*calcium oxide*), or *slaked lime* (*calcium hydroxide*), or *limestone* (*calcium carbonate*) to precipitate non-morphine alkaloids, and then pouring off the morphine in solution. ... *Slaked lime* (*calcium hydroxide*) or, more often, a readily available chemical fertilizer with a high content of *lime*, is added to the solution. *Lime* will convert water-insoluble morphine alkaloid into water-soluble calcium morphenate.<sup>30</sup>

Avoiding the discussion of amphoterism<sup>31</sup> and imperfect double decomposition, it is enough to notice here that the combination of lime, water and opium results in much of the morphine remaining in the solution. Notice that from these reports had Lin used lime alone and had then immediately discarded the liquid, he would have removed much of the morphine from the opium.

### 3. SALT AND LIME

Before considering the effect of salt and lime on opium, it may be of some value to review more closely some of the different chemical combinations that might have been produced when Lin added lime to his salt brine. Recalling the discussion in chapter twenty-one, what Lin is doing with his *non-opium* ingredients shares certain similarities with well known European chemical processes.

First, Lin is producing calcium hydroxide. Lin throws into his tank full of salt, water and opium "whole pieces of thoroughly heated limes."<sup>32</sup> Whatever the limes are (chalk, limestone or shell), they were predominantly heated calcium carbonate,  $\text{CaCO}_3$ . If calcium carbonate is heated "at about 1000 degrees centigrade, it undergoes

---

<sup>30</sup> "Opium Poppy Cultivation and Heroin Processing in Southeast Asia," U.S. Department of Justice, Drug Enforcement Administration, March 2001, DEA - 20026, pp. 10-12, found at <http://www.shaps.hawaii.edu/drugs/dea20026/dea20026.html>; a second version is available at <http://opioids.com/jh/index.html> pp. 13-15 and a third 1993 version of the same booklet can be found at [www.erowid.org/archive/rhodium/chemistry/opium.html](http://www.erowid.org/archive/rhodium/chemistry/opium.html).

<sup>31</sup> See Appendix D - Chemistry.

<sup>32</sup> Kuo, p. 246.

thermal decomposition, loses carbon dioxide and turns into *quicklime* (calcium oxide,  $\text{CaO}$ ).<sup>33</sup> This partial conversion of calcium carbonate (limestone, seashell, etc) into calcium oxide is said to produce carbon dioxide.<sup>34</sup> Next, his hired laborers throw this hot limestone or shell and quicklime mix into a vat of salt brine and opium; it "instantly boils, burning by itself."<sup>35</sup> If the solution is saturated and the opium to water ratio is 1 : 10, then roughly two thirds of this salt and opium brine is water. Quicklime added to water gets slaked lime and lots of heat. The process is called slaking. Chemically the reaction is written,  $\text{CaO} + \text{H}_2\text{O}$  yields  $\text{Ca(OH)}_2$ : "The reaction is highly exothermic."<sup>36</sup>

Second, some hydrochloric acid should have been produced in a reaction between this heat, the salt and the water. The sodium chloride ( $\text{NaCl}$ ) dissolved in the water ( $\text{H}_2\text{O}$ ) when suddenly heated could have formed sodium hydroxide ( $\text{NaOH}$ ) and hydrochloric acid ( $\text{HCl}$ ). Both Gay-Lussac and Tilgeman experimented with this process.<sup>37</sup> The salt and the water contain all of the elements necessary to make up hydrochloric acid, only the heat is missing. How "highly exothermic"<sup>38</sup> is the reaction between the quicklime and water? A 19th century chemistry text hints it can char wood and

<sup>33</sup> Found at [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm); Phillips, pp. 157, 211; Chang, Raymond. *Química*. 6th edition. Mexico, D.F.: McGraw Hill, 1999, p. 740.

<sup>34</sup> Found at [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm); Phillips, pp. 157, 211; Chang, Raymond, p. 740.

<sup>35</sup> Kuo, p. 246.

<sup>36</sup> Found at [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm);

<http://scifun.chem.wisc.edu/chemweek/lime/lime.html>; [www.answers.com](http://www.answers.com); Chang, Raymond, p. 822; Phillips, p. 494; Fine, p. 366; Burns, p. 310.

<sup>37</sup> Gay-Lussac. "Reflections on Volcanoes," a paper read before the Royal Academy of Sciences at Paris and published as "Theory of Volcanoes" in *The Monthly Magazine or British Register*. Vol. LX. Part Two. London: George B. Whittaker, 1825, p. 497 (GB); Tilgeman, Richard. "Decomposing Power of Water at High Temperatures," *The Civil Engineer and Architect's Journal* published in the *Scientific and Railway Gazette*, vol. XI. London: R. Groombridge and Sons, 1848, p. 181 (GB).

<sup>38</sup> Found at [www.gcsechemistry.com/rk20.htm](http://www.gcsechemistry.com/rk20.htm);

<http://scifun.chem.wisc.edu/chemweek/lime/lime.html>; [www.answers.com](http://www.answers.com); Chang, Raymond, p. 822; Phillips, p. 494; Fine, p. 366; Burns, p. 310.

even burn boats.<sup>39</sup> But any HCl produced would probably have been transient.

Third, sodium carbonate and calcium chloride should have been formed in a reaction between the salt, lime and limestone or shell, water and heat. Another way of thinking about the combination of Lin's non-opium ingredients is to treat it as a modified Solvay process, without the ammonia catalyst. The water in Lin's tank is not fresh water, it is a salt brine, made that way by the addition of sea salt. Combining lime with a salt brine approximates what is known as the Solvay process for producing sodium carbonate, written chemically as salt and limestone give sodium carbonate and calcium chloride:  $2\text{NaCl} + \text{CaCO}_3$  produces  $\text{Na}_2\text{CO}_3 + \text{CaCl}_2$ .<sup>40</sup> The Solvay process uses ammonia as a catalyst because (*italics added*):

*without the ammonia, a hydrochloric acid byproduct would render the solution acidic, and arrest the precipitation. ... The only major inputs to the Solvay process are salt, limestone and thermal energy, and its only major byproduct is calcium chloride ....*<sup>41</sup>

The ammonia (base) is there to soak up the hydrochloric acid, forming the salt, ammonium chloride, allowing the reaction to continue. The 1823 Encyclopaedia Britannica explains what happens without the ammonia catalyst (*italics added*):

*It has been proposed to decompose sea-salt by means of lime, for obtaining the soda. Soda is separated from the acid by mixing the common salt with lime, in the form of a paste, and by exposing it to moisture. .... (L)ime acts on salts with fixed alkaline bases. It decomposes a small part of the muriate of soda, with which it is in contact, and the soda, eliminated by this means, combines with the carbonic acid of the atmosphere [carbon dioxide]. The carbonate of soda effloresces, so that it opposes all resistance to the action of the lime, and*

---

<sup>39</sup> Kane (1842), p. 565 (GB).

<sup>40</sup> Wikipedia.

<sup>41</sup> Wikipedia.

the decomposition continues until it is impeded by the quantity of *muriate of lime* [calcium chloride] formed.<sup>42</sup>

The Solvay process without the ammonia also generates sodium carbonate but the reaction is halted by the calcium chloride, a byproduct of the reaction between the heat, water and salt. This yields hydrochloric acid some of which might then have combined with the calcium oxide to produce calcium chloride and more water.

Fourth, much of Lin's reaction with the lime and salt brine is going to take place at a boundary layer between the water and the atmosphere. As explained by Scheele, the calcium oxide takes the chloride from the sodium chloride and the sodium combines with the leftover oxide and the carbon dioxide in the air. It should be apparent that the carbon dioxide is making a circle: calcium carbonate outgasses carbon dioxide to become quicklime (calcium oxide) and the sodium oxide combines with carbon dioxide to become sodium carbonate, hence Solvay's carbonating towers. Not only is Lin slaking lime when he adds "whole pieces of thoroughly heated limes" to his brine, he is bubbling into it carbon dioxide, at least at the surface. From another point of view, there are actually two separate reactions, again following the analogy of the Solvay process but without the ammonia. In the first, the heat, salt, water and carbon dioxide yield sodium bicarbonate and hydrochloric acid:  $\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$  gives  $\text{NaHCO}_3 + \text{HCl}$ . In the second, the sodium bicarbonate becomes sodium carbonate, carbon dioxide and water:  $2\text{NaHCO}_3$  gives  $\text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$ .<sup>43</sup> A second source of carbon dioxide is possible: "Hydrochloric acid reacts with sodium carbonate to produce carbon dioxide gas:  $2\text{HCl} + \text{Na}_2\text{CO}_3$  yields  $2\text{NaCl} + \text{H}_2\text{CO}_3$ ."<sup>44</sup> The carbonic acid is unstable and decomposes:  $\text{H}_2\text{CO}_3$

---

<sup>42</sup> Encyclopaedia Britannica; Or, a Dictionary of Arts, Sciences and Miscellaneous Literature. Sixth edition. Vol. V. Edinburgh: Archibald Constable and Company, 1823, p. 570 (GB).

<sup>43</sup> Lister, Ted. "The thermodynamics and equilibria involved in the Solvay process for producing sodium carbonate," part of "Sodium Carbonate - A Versatile Material," [www.chemsoc.org/pdf/LearnNet/rsc/SodiumCarb\\_sel.pdf](http://www.chemsoc.org/pdf/LearnNet/rsc/SodiumCarb_sel.pdf).

<sup>44</sup> Katz, Donald A. "Mystery Solutions," [www.chymist.com/mystery%20solutions.pdf](http://www.chymist.com/mystery%20solutions.pdf).



gives  $\text{CO}_2 + \text{H}_2\text{O}$ . A third reason carbon dioxide might have been present is the reaction between limestone and hydrochloric acid:  $\text{CaCO}_3 + 2\text{HCl}$  yields  $\text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$ , or calcium carbonate and hydrochloric acid give calcium chloride, carbon dioxide and water.<sup>45</sup> Had these pieces of lime sunk in the brine solution, the carbon dioxide released from these reactions would have bubbled through the entire solution. Two decades before Solvay received a patent for his carbonating towers, Lin would have effectively created a carbonating pond.

#### 4. SALT, LIME AND OPIUM

But these are only the reactions between the heat, lime and limestone or shell, salt, water and the atmosphere. What happens to the opium in this caustic broth? To answer this question would entail examining each of the separate components of the opium in its reaction with the other ingredients already listed. As a simplification, one important component of the opium might be followed. Presented are four suppositions as to the reactions and combinations between the basic ingredients and the morphine.

First, there may have been a reaction between the hydrochloric acid, lime, carbon dioxide and the morphine. This resembles very much Robinet's experiment as reported by Henry and Bouillon-LaGrange where he first acidifies the solution with muriatic (hydrochloric) acid and then precipitates the morphine with lime and carbonic acid gas (carbon dioxide):<sup>46</sup>

Having operated on the residue left by the action of muriatic acid on opium, and precipitated the morphia from the muriatic solution, *he passed a current of carbonic acid gas through the solution to precipitate the excess of lime. This precipitate was found to be mixed with a very large proportion of morphia ... it appeared that much more morphia was obtained by those processes, in which*

<sup>45</sup> From [http://en.wikipedia.org/wiki/calcium\\_carbonate](http://en.wikipedia.org/wiki/calcium_carbonate).

<sup>46</sup> Henry (1831), p. 258 (GB); Bouillon-LaGrange, P.-J., et al, editors. "*Section de Pharmacie*," *Journal de pharmacie et des sciences accessoires*, vol. 13. Paris: Chez Louis Colas, 1827, p. 24; found at <http://gallica.bnf.fr>.

*lime* had been used to precipitate morphia, than by those in which magnesia had been employed (Quart. Journ. N. S. ii. 216).<sup>47</sup>

The same notice in the *Journal de Pharmacie* read (*italics added*):

M. Robinet reports that having treated different residues of opium by *muriatic acid*, and precipitated the morphine by *lime*, it appears that the excess of this last [the *lime*] retained morphine in the solution. In order to obtain it, he passed through the liquid a current of *carbonic acid gas*, he precipitated *lime carbonate* along with the morphine that he found easy to separate. M. Henry has also tried using *quicklime* in the treatment of opium in order to separate the morphine (*in place of magnesia or ammonia*).<sup>48</sup>

Second, there is a possible precipitation of the morphine in a variation of the Pelletier-Thibouméry-Mohr process which used hydrate of lime (calcium hydroxide) and hydrochloric acid (*italics added*):

Other processes have been proposed, as that of M. Thiboumery, which consists in adding *hydrate of lime* in excess to an infusion of opium, by which the meconic acid is rendered insoluble, while the morphine is taken up with ease by the alkaline earth. By exactly neutralizing the filtered solution with *hydrochloric acid*, the *morphine is precipitated*, but in a somewhat coloured state.<sup>49</sup>

<sup>47</sup> Henry (1831), p. 258 (GB).

<sup>48</sup> Bouillon-Lagrange, P.-J., et al, editors. "Section de Pharmacie," *Journal de Pharmacie et des Sciences Accessories*, vol. 13. Paris: Chez Louis Colas, 1827, p. 24; found at <http://gallica.bnf.fr>. Originally, *M. Robinet annonce qu'ayant traité différens résidus d'opium par l'acide muriatique, et précipité la morphine par la chaux, il s'aperçut que l'excès de cette dernière retenait de la morphine en dissolution. Pour l'obtenir, il fit passer dans la liquide un courant de gas acide carbonique, il se précipita du carbonate de chaux avec la morphine qu'il fut facile de séparer. M. Henry avait aussi essayé l'emploi de la chaux vive dans le traitement de l'opium pour séparer la morphine (au lieu de la magnésie ou de l'ammoniaque).* Muriatic acid and carbonic acid gas are older chemical names for hydrochloric acid and carbon dioxide, respectively.

<sup>49</sup> Fownes, George. Elementary Chemistry, Theoretical and Practical. Philadelphia, PA: Blanchard and Lea, 1855, p. 445 (GB)

The calcium hydride would have resulted, of course, from Lin's calcium oxide meeting the water (slaking).

Third, there is the presence of the calcium chloride to consider, produced when the lime (calcium oxide) switches bases with the salt (sodium chloride). The Gregory-Robinson method used calcium chloride to precipitate the other elements of opium, leaving the morphine in the solution which then crystallizes:

The concentrated aqueous extract from the finely powdered opium is treated with strong *calcium chloride* solution, which removes as calcium salts the meconic acid, lactic acid, and sulphuric acid. From the mother-liquor the so-called Gregory-salt, a mixture of the hydrochloride of morphine and codeine, crystallizes.<sup>50</sup>

Montgomery Robinson added marble (calcium carbonate) and then muriate of lime (calcium chloride) to modify Gregory's process. He stirred in the opium, heated it and let it evaporate: "This evaporation is conducted in a large vessel of tinned iron; and a sufficient quantity of marble, in coarse powder, is added to saturate the free acid."<sup>51</sup> He reduced the liquid and added the calcium chloride (*italics added*):

When the infusion has reached the consistence of syrup, an excess of *muriate of lime* [calcium chloride] is poured in, and the boiling is continued for a few minutes longer. Then the whole may be emptied into a large basin, and when cold, *diluted with water until a copious separation of resinous flocks* takes place. In this way most of the meconate of lime, which is nearly insoluble, and a great quantity of colouring matter, are got rid of.<sup>52</sup>

Kane (1842) describes the result of this process using calcium chloride (*italics added*):

---

<sup>50</sup> Small, p. 175.

<sup>51</sup> Robertson, Montgomery. "Process for preparing pure Muriate of Morphia," *American Journal of the Medical Sciences*, volume 10. Philadelphia, PA: Carey and Lea, 1832, p. 488 (GB).

<sup>52</sup> Robertson (1832), p. 488 (GB).

the clear liquor is to be decomposed by a slight excess of ... *chloride of calcium* (Edinburgh). The meconate of morphia, which exists in the opium, being decomposed, meconate of *lime* ... is precipitated, and muriate of morphia remains dissolved; the liquor is to be carefully strained and evaporated to a pellicle; *on cooling, the salt crystallizes*; this is to be pressed between folds of cloth, to remove the dark mother liquor, and then dissolved in boiling water, digested with ivory black, and recrystallized until the crystals become permanently white. The product of this method, although not chemically pure, is sufficiently so for medicinal uses. *It contains codeine, and sometimes others of the opium alkaloids*. To obtain the pure salt, pure morphia should be dissolved in dilute muriatic acid, and the salt crystallized.<sup>53</sup>

Once again, upon cooling, morphine is precipitated.

Fourth, there is the reaction yielding sodium carbonate. Solvay process sodium carbonate is used by a number of chemists to precipitate not just morphine but all of the alkaloids from the opium. According to Barbier (1950), Merck was one of the early 19th century chemists who experimented with sodium carbonate treatments of opium (*italics added*):

When the opium liquids are reduced to one litre per kilogram of opium ... (t)he liquids are heated to 85°-90° and *precipitated at that temperature by powdered Solvay-process sodium carbonate*. ... When persistent alkalinity is achieved, *the mixture is cooled; there is a precipitate of small grains* which are filtered off and washed. They are then dried without heat in order to remove as much of the water as possible, as *the total alkaloids* are not dried in the oven before the treatment is continued.<sup>54</sup>

Heumann (1957) also precipitates all of the alkaloids with sodium carbonate (*italics added*):

The combined filtrates and washings from the meconate are further precipitated by adjusting the pH to 9.0-9.2 by the addition of *powdered sodium carbonate*. *The total alkaloids, which precipitate now*, are centrifuged and washed the following day. After drying at a temperature not exceeding 60°C, *the raw total alkaloids are obtained as a brown, granular powder*.<sup>55</sup>

<sup>53</sup> Kane (1842), p. 1062 (GB).

<sup>54</sup> Barbier, p. 6.

<sup>55</sup> Heumann, pp. 5-6.

Once again, morphine (along with the other alkaloids) is precipitated.

A helpful analogy to Lin's process is that, rudely simplified, Lin has substituted morphine for the ammonia in the Solvay process. Adding heated limestone or shell to a salt brine is the heart of the method related by Lin to the emperor; it is also a variation of the early Solvay process, without the ammonia catalyst. In this not completely far-fetched scenario, the missing ammonia ingredient has been replaced, more precisely, by the barbarian opium. Each component in the opium will react differently to the solution of lime and brine: some will dissolve, others will remain insoluble.

One portion of the opium that resembles the ammonia is the morphine. The morphine, like other amines, is built upon the ammonia molecule ( $\text{NH}_3$ ) but it simply has the hydrogens replaced by hydrocarbon groups.<sup>56</sup> This suggests that the morphine will react in a similar fashion as does the ammonia in the Solvay process, i. e., combining with the hydrochloric acid to form a morphine hydrochloride just as the ammonia combines with the hydrochloric acid to form ammonium chloride. This might have been termed, by 19th century standards, the Lin-Solvay process for morphine. Had Lin applied, perhaps he might even have received an English patent.

## 5. TANK CONSTRUCTION AND SETTLING

No matter which recipe Lin followed, there is the construction of the tanks to be considered. If Lin combines his ingredients in the same tank and lets them settle, it seems clear he will precipitate many if not all of the alkaloids from the opium mixed together into a sludge on the bottom of the tank. On the other hand, he could have used a series of cascading tanks.

In the latter construction, tank one would become a settling tank, to allow the mud and silt in the river water to sink to the bottom. Bridgman observes the first tank being filled with water, but no opium is being added and no work being done.<sup>57</sup> The first

---

<sup>56</sup> See Appendix D - Chemistry.

<sup>57</sup> *CR*, vol. 8, p. 73 (GB).

tank in a series of coastal salt ponds is normally used for the purpose of allowing the water to settle (*italics added*):

*The first pond, which is usually about five feet deep, has a sluice, by means of which it can be filled from the sea. Here the water is allowed to deposit its mud and become clear.* From this pond it passes by means of a pipe into a second pool, much smaller and shallower ... before it escapes out the opposite angle into a third pond .... From the third pond it passes into the fourth, where it begins to crystallize.<sup>58</sup>

Of course, Lin is using fresh water, not seawater so there is the question of whether or not he needs to do this. Chunhow is near the Pearl River estuary so it is unlikely Lin's fresh water could have been compared to that from an uncontaminated mountain spring; for this reason it might have contained a good deal of undissolved solids, mud and silt.

The settled water from tank one could then have been passed to tank two where the opium and salt would have been added and allowed to soak for half a day. The only tank Bridgman sees forms built over and the only tank where work is being done on the opium during the brief barbarian inspection visit is tank number two.<sup>59</sup>

Lin next added the thoroughly heated limes to Bridgman's tank two. There are two possibilities: the addition of the lime might have left the morphine temporarily soluble in the liquid while most of the other alkaloids including much of the codeine would have fallen into the sludge onto the bottom, as in the method of the Southeast Asian chemists. He could then have passed this salt-saturated, morphine rich solution over to tank three to allow it to cool, precipitating and crystallizing the morphine along with whatever other alkaloids might have remained. Alternatively, he could have added salt to tank two, passed the salty, oily liquid over to tank three and then added the lime. Bridgman does not record any forms over tank three or any work being done.

---

<sup>58</sup> Sproule, John, editor. *The Irish Industrial Exhibition of 1853*. Dublin: James McGlashan, 1854, p. 77 (GB). *Italics Sproule*.

<sup>59</sup> *CR*, vol. 8, pp. 73-74 (GB).

Either way, if he cooled the solution in tank three, this is where the morphine would have precipitated. The DEA's observer writes that upon cooling, within a few hours "morphine base precipitates (crashes) out of the solution and settles to the bottom of the cooking pot."<sup>60</sup> The Southeast Asian chemists use a mixture of lime and ammonium chloride not sodium chloride. Barbier writes: "When persistent alkalinity is achieved, *the mixture is cooled; there is a precipitate of small grains* which are filtered off and washed."<sup>61</sup> Barbier was describing the precipitation of all of the alkaloids by sodium carbonate which probably would have been present in Lin's solution. Robiquet produced a precipitate using ammonia and a settling time (*italics added*):

When the action was completely finished, I filtered the liquid and boiled it. At this point *I added an appropriate quantity of ammonia; I retired it from the fire and I received, after cooling, the precipitate which had formed;* but I saw that the proportion was much less than the ordinary method ... and I obtained hardly four grams of morphine.<sup>62</sup>

In his second memorial to the emperor on the process Lin repeats the detail of the settling time: "In all, we wait till all has been thoroughly destroyed and then sent to sea at the time of the receding tide."<sup>63</sup> Bridgman sees the third tank "about half-filled, standing like a distiller's vat, not in a state of active fermentation, but of slow decomposition, and was nearly ready to be drawn off."<sup>64</sup> All that would have been needed to move the solution was a connecting channel between the tanks.

---

<sup>60</sup> DEA 20026, p. 11.

<sup>61</sup> Barbier, p. 6.

<sup>62</sup> Robiquet. "*Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium*," *Journal de Pharmacie*, vol. 12 (1826), pp. 70-71.

Originally, *Lorsque l'action fut entièrement terminée, on filtra la liqueur et on la soumit à l'ébullition. Arrivé à ce point, je versai une quantité convenable d'ammoniaque: je retirai du feu et le recueillis, après refroidissement, le précipité qui s'était formé, mais je vis que la proportion en était bien moindre que par la méthode ordinaire ... et j'obtins à peine 4 grammes de morphine.*

<sup>63</sup> Kuo, p. 248.

<sup>64</sup> *CR*, vol. 8, p. 74 (GB).

The only two pieces of evidence that he might have done this come from Bridgman who notices that tank two which Lin is filling with opium only has two feet of water and tank three, which is waiting to be discharged is about half full or three and a half feet of the estimated seven foot deep tanks. This suggests a possible conduit from tank two to tank three. Bridgman does not notice any such conduit or tank two may simply have been filling with water during the half hour Bridgman was observing it. Depending on the size of the aqueduct, such a huge tank may have taken a considerable time to fill halfway up with water.

The second piece of evidence is also from Bridgman, who notices only the one sluice on tank three and the one sieve-like filter. If only tank three has an exit, then tank one and tank two must discharge somewhere, presumably into tanks two and three, respectively. Bridgman again does not notice such conduits and whether the other tanks had exits or not is certainly debatable. Bridgman might not have noticed such an interconnecting channel because it could have been below the surface of the muddy brown liquid.

Unless there is some physical evidence that links one tank with another, had one tank been dug on slightly higher ground for example or had there been a channel from one tank into a second, it is impossible to say for sure. Only a careful examination of the existing remains on site could clear up this question. The technology and knowledge for constructing a series of cascading tanks was available. Lin had been a salt controller.<sup>65</sup> One method of making salt uses interconnecting salt evaporation ponds.<sup>66</sup> Raffles notices such pans being used in Java.<sup>67</sup> Lin could have constructed his tanks to operate in this fashion. Bridgman does not

---

<sup>65</sup> Chang, pp. 121-122.

<sup>66</sup> Sproule, John, editor. *The Irish Industrial Exhibition of 1853*. Dublin: James McGlashan, 1854, p. 77 (GB); Huskisson, H. Owen. "Salt - The Sources from Whence it is Obtained, and the Processes Involved in its Manufacture," *Journal of the Society of Arts*, vol. 1. London: George Bell, 1853, p. 426 (GB); Tomlinson, Charles. *The Natural History of Common Salt: Its Manufacture, Appearance, Uses and Dangers, in Various Parts of the World*. London: Society for Promoting Christian Knowledge, 1850, pp. 260-261 (GB).

<sup>67</sup> Tomlinson (1850), pp. 271-272 (GB).



notice any such conduit. Either way, with a single tank or multiple tanks, the precipitate obtained on his filter after the settling and cooling would probably have contained a serious and non-negligible quantity of morphine.

## B. BRIDGMAN'S RECIPE

Bridgman's version of Lin's recipe is slightly but significantly different in that both the salt and lime are added together in the second tank at the same time: "Other coolies were employed in bringing salt and lime, and spreading them profusely over the whole surface of the trench."<sup>68</sup>

Bridgman's account is the most careful, least embellished and most observant of the three. Bridgman observes work being done only on tank two. Only tank two has forms. He sees the workmen in the trenches "beating and turning up the opium" in the water. He sees other coolies "bringing salt and lime" at the same time as the opium is being broken up and kicked into the vat. He notices the screen "made fine like a sieve" on tank three. Tank three was standing like a "distiller's vat" but by this he does not seem to mean a vat of an alcohol distiller, but instead a vat of an opium distiller, because he refers to it as not being in a state of "active fermentation" but of "slow decomposition." He does not, however, notice the separation into a floating oil and a sinking precipitate.

Remarkd upon earlier is that Bridgman does not record the sudden release of heat when the quicklime is thrown into the mixture. There are a number of possible reasons for this: first, he may not have seen it and was simply describing what Loo his tour guide told him was the process; second, he may have observed it and did not think the dramatic boiling that would have been produced worth reporting; third, Bridgman's lime may have been slaked lime (calcium hydroxide).

The use of slaked lime instead of quicklime has been reported by a number of investigators. The DEA's anonymous observer says

---

<sup>68</sup> *CR*, vol. 8, pp. 73-74 (MD).

S. E. Asian chemists can use any of three possibilities to pull out the morphine into solution (*italics added*):

The process of extracting morphine from opium involves dissolving opium in boiling water, adding *lime (calcium oxide)*, or *slaked lime (calcium hydroxide)*, or *limestone (calcium carbonate)* to precipitate non-morphine alkaloids, and then pouring off the morphine in solution. ... *Slaked lime (calcium hydroxide)* or, more often, a readily available chemical fertilizer with a high content of *lime*, is added to the solution. *Lime* will convert water-insoluble morphine alkaloid into water-soluble calcium morphenate. (Other opium alkaloids do not react with *lime* to form water-soluble calcium salts, as does morphine).<sup>69</sup>

Heumann (1957) uses calcium hydroxide to precipitate narcotine and meconic acid (*italics added*): "If narcotine is not to be used, both narcotine and meconic acid can be precipitated together by replacing *sodium hydroxide* with *calcium hydroxide (slaked lime)*."<sup>70</sup> He also purifies his morphine using calcium hydroxide (*italics added*):

Purification by *lime*. - The slightly humid raw morphine is mixed in an open stirring vessel with four times its weight of water, and *slaked lime* is added until the solution remains strongly alkaline to phenolphthaleine. The solution now contains all the morphine as calcium morphinate and is filtered off by vacuum on a Buchner filter.<sup>71</sup>

Kane's *Elements of Chemistry* (1842) describes the use of calcium hydroxide in the Merck process (*italics added*):

The process of Merck is founded on the solubility of morphia ... in *lime* water. Opium is to be digested in three times its weight of water, then expressed, and then repeated three or four times; these solutions being mixed are brought to a

<sup>69</sup> "Opium Poppy Cultivation and Heroin Processing in Southeast Asia," U.S. Department of Justice, Drug Enforcement Administration, March 2001, DEA - 20026, pp. 10-12, found at <http://www.shaps.hawaii.edu/drugs/dea20026/dea20026.html>; a second version is available at <http://opioids.com/jh/index.html> pp. 13-15 and a third 1993 version of the same booklet can be found at [www.erowid.org/archive/rhodium/chemistry/opium.html](http://www.erowid.org/archive/rhodium/chemistry/opium.html).

<sup>70</sup> Heumann, pp. 5-6.

<sup>71</sup> Heumann, p. 7.

boil, and *milk of lime* added in slight excess, the precipitate which forms is to be collected on a strainer and strongly pressed ....<sup>72</sup>

Barbier (1950) records the use of calcium hydroxide in the Pelletier-Thibouméry-Mohr process (*italics added*): "The solutions obtained are evaporated to half their volume and poured into boiling *milk of lime*: one part of *lime* in ten parts of water should be used for four parts of opium."<sup>73</sup>

But these investigators were adding slaked lime (calcium hydroxide) to a solution of water and opium. It seems clear from these reports that the slaked lime will do as well as the quicklime in bringing the morphine into the solution. Since Bridgman's solution already contains salt, will the salt and slaked lime together then precipitate the morphine? Normally, ammonium chloride is used for this purpose, not sodium chloride, but under some circumstances this substitution could produce the same effect. Mohr explains the reason he uses ammonium chloride (*italics added*):

The solution is greatly concentrated by evaporation, then filtered, heated to the boiling point and pounded *sal ammoniac* is thrown into it, in about the proportion of one ounce of sal ammoniac to one pound of opium. *The caustic lime is thus converted into chloride of calcium*, the morphine loses its solvent, and is precipitated in small crystalline needles. Opium yields upon an average a sixteenth of its weight of morphine.<sup>74</sup>

Barbier (1950) modified this process by substituting sodium chloride or common salt (*italics added*):

I made certain changes in this process; for instance, instead of precipitating the *lime solution* with ammonium chloride, I acidified it slightly with *hydrochloric acid* and salted out the morphine hydrochloride with *common salt*. In this way I obtained almost all the morphine from the *lime* solution in

---

<sup>72</sup> Kane, Robert. *Elements of Chemistry*. Dublin: Hodges and Smith, 1842, p. 1061 (GB). Sal ammoniac was an early name used for ammonium chloride.

<sup>73</sup> Barbier (1950), p. 2.

<sup>74</sup> Graham, Thomas. *Elements of Chemistry*. Part 3 - Organic Chemistry. London: Hippolyte Bailliere, 1842, p. 977 (GB).

the form of very pure hydrochloride .... I found, however, that this process had one important drawback: the yield was definitely bad.<sup>75</sup>

Robiquet explained the morphine hydrochloride of Robinet this way (*italics added*): "It would be impossible to understand this result without admitting that the *hydrochloric acid* had been furnished by the *sea salt*."<sup>76</sup>

Two factors are important to notice here: one, the quantity of hydrochloric acid that would have been formed and two, the timing of this process, specifically with regards to whether Lin would have been able to pass the solution over between tanks. Slaked lime would not have produced the dramatic release of heat but the addition of sea salt and opium produces a double decomposition between the sodium chloride and the morphine meconate, leaving a sodium meconate and a morphine chloride after evaporation. Until then, the morphine meconate was in solution in the floating oil. The addition of the calcium hydroxide could have precipitated the non-morphine alkaloids into the sludge while allowing the morphine to combine with the chlorine from the salt, producing a morphine chloride or hydrochloride.

If Bridgman is correct and slaked lime was used, not quicklime, it does not seem the combination would have been as vigorous. The reactions are the same, only the heat is missing. Morphine would probably have been precipitated but not in as large a quantity. Once again, the detail of the settling time becomes important and Lin has the option of combining the salt and slaked lime in tank two and then shunting the liquid solution over to tank three. Had he done this, the resulting precipitate in tank three more than likely would have contained a larger proportion of morphine than otherwise. But Bridgman's version of the process if it describes the use of slaked lime probably would not have produced as much morphine on the filter as Lin's recipe.

---

<sup>75</sup> Barbier, p. 2.

<sup>76</sup> Robiquet. "*Observations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium*," *Journal de Pharmacie*, vol. 12 (1826), pp. 71, 73. Originally, *Il me fut impossible de me rendre compte de ce résultat sans admettre que l'acide hydrochlorique avait été fourni par le sel marin*.

## C. THE DEA'S RECIPE

Using lime first and then ammonium chloride is the method used by 21st century Southeast Asian chemists and some 19th century European pharmaceutical manufacturers for the production of morphine base. This third option available to Lin basically follows the Pelletier-Thibouméry-Mohr method but with the substitution of sodium chloride for the ammonium chloride. In this admittedly hypothetical recipe, Lin would have had to add the lime first to an opium and water solution. The lime would have brought the morphine into the solution. Next he would have added the salt (sodium chloride) which probably would have precipitated at least some of the morphine. Depending on when he did this, the reactions of the lime, opium and water with the salt would have been similar to those already described.

Southeast Asian chemists basically follow this process but use ammonium chloride, not sodium chloride. As was seen above, some 19th and 20th century variations suggest that sodium chloride can be substituted in certain circumstances. Instead of using ammonium chloride to precipitate the morphine from the lime solution, Barbier (*italics added*)

acidified it slightly with hydrochloric acid and salted out the morphine hydrochloride with *common salt*. In this way *I obtained almost all the morphine from the lime solution in the form of a very pure hydrochloride.*<sup>77</sup>

This is, of course, exactly the reverse of Lin's sequence of adding the ingredients but it illustrates the combination of a lime solution with morphine, salt and a little hydrochloric acid, all of which would probably have been present in Lin's solution of salt brine, water, quicklime, and opium. How much hydrochloric acid, sodium carbonate and calcium chloride would have been produced by adding the quicklime first and then the salt is unclear and certainly would have depended upon the quantities employed.

---

<sup>77</sup> Barbier, p. 2.

If he had split this process between two tanks, the lime could have been added to tank two and the solution discharged into tank three where the salt would have been added. He could have accomplished the same task by adding both sequentially to the same tank and then discharging the morphine rich liquid into the settling tank (tank three) to cool. Using this two-stage process, Lin could have precipitated a crude morphine base isolated from most of the other alkaloids. If he had not done this transfer, after a few hours or a night of waiting for the tide to change, the morphine in solution probably would have crashed to the bottom of tank two and been mixed in with many of the other alkaloids. Neither Lin nor Bridgman testify that this was the recipe followed.

#### D. DISCUSSION AND QUESTIONS

It is argued that Lin has the knowledge, ingredients and equipment to extract the alkaloids from opium. More than likely he had the knowledge, whether from traditional techniques, his experience in the salt monopoly, the Chinese melters, or the European chemists. Clearly, he had all the right ingredients, the lime, salt, the water and the opium. He certainly had the equipment, several large tanks (possibly interconnected) and a sieve-like filter as well as the workers who stirred the mixture with their plows. He had a choice of recipes.

Lin's recipe as told to the emperor soaks the opium in salt first and then adds the thoroughly heated pieces of lime. The salt could have decomposed the opium by itself; the addition of the quicklime into the salt brine would have precipitated the alkaloids. This process slakes the lime and produces hydrochloric acid which was used with lime and common salt by several chemists to obtain morphine. It anticipates the Solvay patent for producing sodium carbonate, which Barbier and Merck use to precipitate all of the alkaloids from their opium. A byproduct of this process is calcium chloride which Gregory and Robinson use to precipitate a medicinal salt heavy with morphine and codeine.

The second recipe of using calcium hydroxide and salt together does roughly the same thing but perhaps not as efficiently. An

important question would be how fast this reaction takes place and the detail of the settling time becomes important. The third recipe is admittedly speculative. Using the quicklime first, then the sea salt to precipitate the morphine or the alkaloids is Barbier's modification of the Pelletier-Thibouméry-Mohr process. There is some evidence this would work, depending upon the acidity in the tank, but Barbier questions the yield.

With any of the recipes, there is the question of where the solution would have been left to cool. Using a single tank, Lin would have extracted and precipitated the morphine but not isolated it from the other alkaloids. By carefully using a series of interconnected tanks, Lin might even have produced a modern morphine base. Coastal salt ponds were constructed in just this manner. As with the extraction of the alkaloids generally, Lin did have the knowledge and ability to interconnect his tanks and so better isolate the morphine. With all of this evidence, it is easy to assume that is what he did. The problem is that neither the process Lin describes in his memorials to the emperor nor the process described by Bridgman would have isolated morphine. Both Lin and Bridgman describe a process of using salt with lime in a single tank. After cooling and settling, more than likely many if not all of the alkaloids would have been precipitated from the liquid, not simply the morphine, whether at the bottom of tank two or tank three.

For rebuttal, other details of Lin's reports are not exact, such as the size of the tanks and their location. Which suggests that Lin could be also obscuring the details of his method in his dispatches to the emperor. For instance, Lin never mentions the screen. Bridgman may not have observed all of the details of the process during his brief half-hour inspection. Bridgman does not notice the boiling when the lime hits the water, for example.

Whether Lin isolated a morphine base or simply precipitated all of the alkaloids, he certainly had the ability to isolate the morphine using such a sequence of interconnected tanks. His extreme curiosity and attention to detail argue that he would have been aware that with a few simple modifications he could have isolated the morphine from the other alkaloids as well as any of his contemporary chemists and pharmacists in Europe. Whether he

would have wanted to is an entirely separate issue. Both Lin and Bridgman provide negative evidence, the use of lime with salt in a single tank, suggesting this is neither part of Lin's method nor his intention.

One can also ask at this point what is meant by morphine base. There is nothing pure about the process of alkaloid extraction any more than there is in the process of distilling alcohol. Morphine, of course, makes up by far the largest portion of the alkaloids in opium, some 80-90 percent. So in this sense, using the method and ingredients as stated by the observers, Lin would have extracted the morphine but would not have isolated it. But other field chemists report the same contamination. The DEA says, for example, that the morphine base produced by Southeast Asian chemists is "generally 50 percent to 70 percent morphine."<sup>78</sup> Even after its transformation into morphine hydrochloride, it is "often tainted with codeine hydrochloride."<sup>79</sup>

Early 19th century European chemists experienced the same problems of purification. Derosne's salt was most likely narcotine contaminated with morphine and meconic acid, for example. Sertuerner's product was probably not pure morphine, certainly not by 21st century standards. Robinet's and Gregory's salts were combinations of morphine with codeine and different contaminants, but functioned quite well medicinally. Though Lin's product would have had narcotic effects stronger by weight than the original opium, it too would have been a collection of the different alkaloids in a predominantly morphine base. To call one thing morphine base and another not is to depend upon some standard of purification. Lin's salt certainly would not have been pure morphine, no matter how it was obtained. It might even have been called, by the Western standards of the time, Lin's Sedative Salt.

Two generally forgotten details argue Lin's intention to extract and retain the alkaloids from the opium: the settling time and the screen. Using any of these recipes, if Lin is truly trying to destroy the opium, why does he allow the solution to cool and settle? With a

---

<sup>78</sup> DEA 20026, p. 11.

<sup>79</sup> DEA 20026, p. 11.



saturated salt solution, Lin would have brought much of the morphine into the floating brown liquid. Had he simply discarded the liquid at this point without adding any lime, he would have effectively destroyed the most important alkaloid. The lime alone, either calcium oxide or calcium hydroxide, would again have left the morphine floating in the solution, at least temporarily. If he had then simply discharged the solution (without the screen), he would have again essentially rid the opium of much of the morphine. Instead, he allows the solution to cool which in the presence of the salt would have caused the morphine to crash out of the liquid. The solution, stripped of its most important alkaloids, was then sent off into the creek.

Second, he filters his solution suggesting he prefers to capture his precipitate. In Bridgman's words, "It was furnished with a screen, made fine like a sieve, so as to prevent any large masses of the drug from finding their way into the creek."<sup>80</sup> Since they were not going down the sluice to the creek, where were they going to go? Bridgman's screen made fine like a sieve on the exit of tank three would have preserved the morphine-rich solids, King's fetid mud, on the bottom of tank three.

The result of any of the previously discussed recipes probably would have been a morphine-rich precipitate. This result, obtained after much time, labor and expense, could then have been shoveled into sacks and hauled away by oxcart, or (after the liquid had been discharged) pushed down the sluiceway into waiting chop boats to be taken to the salt works to be spread out in the sun or stacked up in heaps and dried. Most likely this resulting salt would have been a coarse, brown powder similar in appearance to a modern morphine base but it probably also would have been a morphine base mixed with codeine and the other alkaloids as well. But once Lin has obtained this result, what can he possibly do with it?

---

<sup>80</sup> *CR*, vol. 8, p. 74 (MD).

## XXIV THE RESULT

---

- XXIV. THE RESULT
- A. DISCARDED
    - 1. VALUE
    - 2. FUNDING
    - 3. COST OF PRODUCTION
  - B. SOLD
    - 1. IN THE WEST
    - 2. IN CHINA
  - C. DISCUSSION

*WITH* his knowledge, ingredients, equipment and recipe, Lin could have obtained a result, an alkaloid rich residue collected on his filter "made fine like a sieve." From the perspective of alkaloid extraction, it is this residue or sifting, as Lin calls it, which is the most important product of this large chemical separation of opium. As an aside, an echo to the use of the word, sifting, shows up in C. Greville Williams' Handbook of Chemical Manipulation (italics added):

Filtration is, in fact, a species of *sifting*, being a process by means of which we separate more dense and coarse from finer and more subtile particles, by the use of a medium capable of letting the latter pass through its pores while the former is retained.<sup>1</sup>

Once he had obtained this sifting, what he might have done with it, though not required for an understanding of alkaloid extraction, becomes a point of interesting speculation.

---

<sup>1</sup> Williams, C. G. A Handbook of Chemical Manipulation. London: John Van Voorst, 1857, p. 138 (GB).

There were two immediate and simple possibilities for the ultimate disposition of this residue or sifting. One, he could simply have discarded it. Against this, he had many motivations for not destroying it. Two, he could have sold it. The Chinese melters who taught him the process were clearly providing just such a product for the Chinese market. But Lin also had the option of combining these coarse, brown, morphine-rich siftings with various herbs which could then be sold as a cure for the habit of smoking opium.

#### A. DISCARDED

Having gone to the time, trouble and expense of constructing these giant separation tanks, having separated the opium into a floating oil and a sinking sifting, and having discarded the liquid and captured with a screen made fine like a sieve the precipitate formed after the addition of the heated limes to his salt and opium brine that he then permitted to settle and cool, Lin could then have destroyed what he had so carefully manufactured. The simplest method would have been to have sluiced this residue into the river along with or after the liquid.

This is what he says he will do with it in his proclamation at the end of May recorded in the *Chinese Repository* (italics added): "Then it will be *poured off into the midst of the sea, even the very dregs.*"<sup>2</sup> The version included in King's letter to the *Times* is slightly different (italics added): "*and whence it might be conveyed into the sea, that no traces of it might remain.*"<sup>3</sup> John Slade provides a third translation of the same edict (italics added): "... *and the dregs be then cast into the sea.*"<sup>4</sup>

<sup>2</sup> *CR*, vol. 8, p. 36 (MD).

<sup>3</sup> King, Charles W. "Imperial Edict respecting the Surrendered Opium, the Process of Destroying it, and etc. (Extracts from Letters of C. W. King, Esq. of Canton to J. Ballester, Esq.)," *The London Times*, 1 November 1839, Issue 17188, column C, p. 2, found at [http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2\\_TTDA\\_2\\_\\_11/1/1839\\_\\_](http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19/purl=rc2_TTDA_2__11/1/1839__); King italicizes *Hoomun*.

<sup>4</sup> Slade (1839), pp. 109-110 (GB).

In two of these three translations, Lin acknowledges that by mixing the opium with lime and salt he will create "dregs" or some kind of residue. This is not evident from the language of the edict itself, which does not mention water except indirectly. Nor can it be supposed from a mere reading of his proclamation that this mixing of the three substances, lime, salt and opium together will produce anything more than a kind of gummy plaster, hence the origin of the Plastering Tale. Before Lin issues his proclamation of late May or early June 1839, clearly he has been practicing. He anticipates dregs and indirectly a liquid, the latter clearly not as worthy of mention as the dregs. In all three translations he will send the dregs or any traces of it to the sea.

But once again, just as with Lin's original March edict to the barbarians declaring he would burn their opium, what Lin says he will do in this later proclamation is not what finally happens, at least according to Bridgman, who specifically quotes tourguide Loo as telling him the dregs and any other large lumps of opium will not be discarded into the river or the sea, hence the purpose of the fine, sieve-like screen. In a classic example of bait-and-switch, first he declares he will burn the opium but then decides on a new method with salt and lime and second, he says he will discard the dregs resulting from this new method but instead adds a screen to the exit of tank three.

In the first memorial to the emperor on the process, he does not specifically mention the residue but he does need to wash the bottom of the pond (*italics added*):

At the time of the receding tide, the front exit is opened to let out the melted matter, and *clean water is introduced to wash the bottom of the pond* so that not an iota would be suffered to stay. ... Only by so doing - *cleaning the bottom of a pond whenever using it* - is it possible to prevent cheating or abuse.<sup>5</sup>

---

<sup>5</sup> Kuo, p. 246.

In the second memorial he says all of it is sent to sea (*italics added*): "In all, we wait till *all has been thoroughly destroyed and then sent to the sea* at the time of the receding tide."<sup>6</sup>

There is no direct evidence from the barbarian accounts for or against the exit from any tank of either the liquid or the residue. King supposed the entire vat of fetid mud was to be sluiced into the creek after some days but he did not see this happen during his half-hour inspection tour. Bridgman noticed vat three in a state of decomposition and that it was almost ready but he did not see it discharged.

Lin's process of cleaning the tanks as stated to the emperor would not have removed all of the residue; Bridgman's sieve-like screen would have trapped something. Lin says the tanks were washed clean after every batch, but doesn't say what happened to the siftings caught by the screen after the washing, does not in fact mention the screen at all in his dispatches to the emperor. For all of the contents of the pond to have reached the river or the sea, the screen would have had to have been removed. This could have been done but leads to the obvious next question of why it was there in the first place. The evidence of the screen suggests that Lin wishes to preserve some portion of whatever is in his tanks after he finishes mixing opium, water, lime and salt. Why Lin would not have wanted to discard these siftings deserves some consideration.

## 1. VALUE

The easy answer is that there were 20,000,000 good Indian reasons, 10,000,000 good Spanish reasons, and close to three million good English reasons not to destroy them. The value of the opium had been melted into the residue. To ask why he would not have wanted to destroy the residue is to ask why he would not have wanted to destroy the opium in the first place.

The merchant Charles King estimated the value of the opium at 20,000,000 Indian rupees.<sup>7</sup> Chang says it "cost the foreign

---

<sup>6</sup> Kuo, p. 248.

merchants nearly eleven million (Spanish) dollars originally and, even at the current low market price, was still valued at nine million dollars."<sup>8</sup> The market price fluctuated during the 1830s due to the suppression campaigns of domestic opium and the break-up of the China monopoly of the BEIC. The twenty thousand chests would have been, in a good year in the 1830s, either half or all of the opium imported into China. Chang gives the imports of chests of opium for the first and second years of free trade at the port of Canton: 16,516 chests for the year 1834-1835 worth a total of 9,654,970 dollars and 27,111 chests for the year 1835-1836 worth 17,904,248 dollars.<sup>9</sup> Chang says that the value of the opium was estimated at "between two to three million sterling by the opium holders:"<sup>10</sup>

The British merchants ... conceive that they have a double claim to compensation ... first ... against their own Government, and secondly, against the Government of China .... estimated at not less than 2,400,000 pounds sterling.<sup>11</sup>

What is that in 21st century money? There are various estimates. One website, for example, says that what cost one dollar (U.S.) in 1839 would cost \$15.60 in 2000.<sup>12</sup> Figuring in English pounds, one pound in 1839 would be worth 55.88 using the retail price index, 79.70 using the GDP deflation, 567.62 using average earnings, 732.50 using per capita GDP, and 1,646.40 using the GDP.<sup>13</sup> Using these calculations, 2.4 million sterling in 1839 would be worth somewhere between 132 million and almost four billion

---

<sup>7</sup> Beeching, Jack. Chinese Opium Wars. London: Hutchinson, 1975, p. 85; Allen, Nathan, p. 48.

<sup>8</sup> Chang, pp. 172, 266, quoting an estimate by Samuel Wells Williams in The Middle Kingdom. Vol. 2. London, 1883, p. 503.

<sup>9</sup> Chang, p. 23.

<sup>10</sup> Chang, p. 266; Chang gives other estimates of between 2.0 to 2.4 million sterling by other authors on the same page.

<sup>11</sup> "Statement of Claims of the British Subjects Interested in Opium Surrendered to Captain Elliot at Canton for the Public Service." London: Pelham, Richardson, 1840, p. 3 (GB).

<sup>12</sup> From [www.westegg.com/inflation/infl.cgi](http://www.westegg.com/inflation/infl.cgi).

<sup>13</sup> From [www.measuringworth.com](http://www.measuringworth.com).

English pounds in the year 2000. The most conservative estimate is just slightly lower than the lesser figure, adopted by the House of Commons which commissioned a study of how the value of the pound has changed with inflation during the period 1750 to 1998. By their calculation, one pound from 1839 is worth only 55.33 pounds in 1998.<sup>14</sup> By choosing this estimate, if the opium was worth 2.4 million pounds sterling in 1839, it would again be worth only some 132 million pounds sterling in 1998.

The value of Lin's confiscated opium could also be compared by the current and most popular form of opium being imported into either Europe or the United States, heroin. Lin says he destroyed 2,376,254 catties (roughly 3 million pounds) or about 1.5 million kilograms.<sup>15</sup> If we accept an average of 10 percent for the morphine content,<sup>16</sup> then this would be the equivalent of some 150,000 kilograms of morphine. The DEA estimates that for each "kilogram of morphine, 685 grams to 937 grams of crude heroin base is formed, depending on the quality of the morphine."<sup>17</sup> Of course, at this point adulterants begin to be added when being further processed either for smoking or injecting. Finally, there is the question of the value of the heroin retail or wholesale.

The United States Office of National Drug Control Policy says that while one pure gram of heroin retailed for \$269.54 in 2000, ten grams could be had wholesale for \$153.60.<sup>18</sup> Sold by the gram, 100,000 kilograms of heroin would retail for more than 26 billion dollars. Sold in 10 gram lots, the value would be worth only 15 billion dollars. The United Nations Office of Drug Control has different figures: Heroin number 4 retails per gram at roughly 100 dollars per gram with an average purity of 35 percent in the U.S., at

---

<sup>14</sup> Twigger, Robert. "Inflation: The Value of the Pound 1750-1998." House of Commons Research Paper 99/20, 23 Feb 1999, pp. 8, 11, 15, from [www.parliament.uk](http://www.parliament.uk).

<sup>15</sup> Kuo, p. 250; Chang, p. 171.

<sup>16</sup> DEA 20026, p. 10.

<sup>17</sup> DEA 20026, p. 13.

<sup>18</sup> "The Price and Purity of Illicit Drugs: 1981 through the second quarter of 2003." ONDCP Publication Number NCJ207768, November 2004, from [www.briancbennett.com/charts/fed-data/heroin-prices.htm](http://www.briancbennett.com/charts/fed-data/heroin-prices.htm).

\$66,250 per kilogram with an average purity of 72 percent in 2004; in France the retail cost is also about 100.00 dollars per gram but the purity is only 6 percent while a kilogram runs about 50 thousand dollars (U.S.).<sup>19</sup> Using these figures 100,000 kilograms of heroin number four would be worth almost 30 billion dollars retail and 10 billion dollars sold by the kilogram in the United States, absurdly more in France, had the opium been turned into heroin number four, which it certainly wasn't.

No matter how it is calculated, the value of the confiscated opium was extraordinary, astronomical. This is what the foreign observers had difficulty believing, that this pagan should have "destroyed" so much obvious wealth.

## 2. FUNDING

Lin isn't getting paid. "Mandarins were poorly paid [and] used their perquisites of office" to make up for their poor salaries.<sup>20</sup> At whatever post he occupies in the Manchu bureaucracy, he must make it pay. Mandarins are civil servants but without a salary. The central government in Beijing does not support them and won't pay for their plans. They must make their own salaries from whatever project they are in charge of. In this, they must also be good businessmen.

Thus, a certain cupidity was demanded by the very nature of Ch'ing dynasty bureaucracy. Positions in this bureaucracy were purchased. A mandarin drew no salary from the central government and was expected to make his fortune from his positions in that bureaucracy. Lin had to skim some profit from the administration of his various endeavors, because the court and the emperor could and did regularly put the squeeze on Lin and the other mandarins as well. G. Trudgill Lay termed it the problem of the "needy avarice of men who have pawned more than their all in the purchase

---

<sup>19</sup> "Opiates: Wholesale, street prices and purity levels, prices in Europe and the USA 1990-2005," found at [www.unodc.org/pdf/WDR\\_2006/wdr\\_2006\\_chap5\\_opium.pdf](http://www.unodc.org/pdf/WDR_2006/wdr_2006_chap5_opium.pdf).

<sup>20</sup> Fay, p. 46.



of places, and who are ever liable to be drained dry by those above them."<sup>21</sup> In this, Lin acted less like a modern civil servant and more like a medieval European tax collector or modern U.S. debt collection agency, taking a percentage out of every imperial enterprise.

### 3. COST OF PRODUCTION

Lin's chosen method differs dramatically from the previous standard method used by both Lin and others to destroy confiscated Chinese opium - the use of fire and wutung oil, the remnants discarded into the nearest stream. Lin could have used this method. He says that he had used it previously.

Instead, Lin chooses a new and untried method that involves a massive amount of labor, time and expense. By contrast, fire and wutung oil is relatively efficient and certainly more economical. Both ostensibly accomplish the same purpose. There are also reports that Lin built other tanks as well, again at considerable expense. This begs the question of what return Lin expects for his investment. In short, what does he expect to get out of all of this time, labor and expense?

Noted previously was just how large an enterprise this giant batch-processing of opium for its alkaloids must have been. It required enormous planning and organization as well as the hiring of many laborers, the transportation of mountains of ingredients, and the construction of enormous chemical tanks. In 1839, this would have been the largest such alkaloid extraction in the world, far surpassing anything produced in the laboratories of Merck or Morson. Since European alkaloid manufacturers expected a return on their investments, is it unreasonable to expect that Lin would have also for such a large investment in production?

#### B. SOLD

---

<sup>21</sup> Lay, G. Tradescant. "Remarks on Diplomatic Agency in China," in the *Chinese Repository*, vol. 7, July 1838, p. 142 (MD).

Now that Lin has precipitated from the opium an alkaloid-rich sediment, of what use has he for these siftings? He could have simply sold them as the Chinese melters were doing. But Lin also had another option, to sell these siftings as a cure for opium smoking. To argue that Lin did this, it would be minimally necessary to show that Lin was interested in the subject, that opium-cures containing opium alkaloids were sold during this period in Guangdong province and that Lin knew and approved of these remedies. To prove that he sold his own remedy would require the signed receipts.

## 1. IN THE WEST

The Bayer company produced heroin in 1898 and marketed it for strong pain in the same advertisements as its aspirin for mild pain.<sup>22</sup> It was also "initially touted as a non-addictive morphine substitute."<sup>23</sup> Freud recommended cocaine for the same thing in On Coca (1884):

He concluded by recommending seven conditions for which cocaine treatment might prove useful ... in the treatment of morphine and alcohol addiction .... Physicians, in very large numbers, began to prescribe cocaine for morphine addicts. Within a few months, clinics in Europe and the US were packed with morphine addicts who were also addicted to cocaine.<sup>24</sup>

Morphine had been earlier marketed as a non-addicting substitute for opium addiction: "Morphine appeared in Bengal in 1881. ... Opium eaters began to take morphine pills instead."<sup>25</sup>

But before there were heroin and cocaine cures for morphine addiction and morphine cures for opium addiction, there were opium cures for opium addiction. In fact, the Pure Food and Drugs Act of

---

<sup>22</sup> See photos for example at wikipedia.

<sup>23</sup> Goldfrank, Lewis R. Goldfrank's Toxicologic Emergencies, 7th ed. New York: McGraw-Hill Professional, 2002, p. 9 (GB).

<sup>24</sup> Karch, S. B. A Brief History of Cocaine. Boca Raton, FL: CRC Press, 2006, p. 61 (GB).

<sup>25</sup> Dikötter, et al., p. 147.

1906 (U.S.) was enacted in part to eliminate the "alleged opium cures containing opium"<sup>26</sup> (*italics added*):

The Federal Pure Food and Drugs Act, enacted in 1906, required manufacturers to state on the label the amount of opium, opium alkaloids or derivatives, and cocaine the preparation contained. In addition to other benefits, *this provision did away with the numerous opium cures that contained opium or opium alkaloids as the chief ingredients* and were habit forming in themselves.<sup>27</sup>

The way these opium-based medicines for opium addiction worked was simple: "The patient graduates from a number one bottle to a number two, containing less opium, and so on, until finally he is supposed to be cured ...."<sup>28</sup> They were widely sold: "An official examination of 70 opium cures, purchased in the open market, showed that every one of the 70 contained some form of opium, sold at exorbitant rates."<sup>29</sup>

The best current Western example of this procedure of "curing" an addiction with the alkaloid itself might be nicotine gum or patches to "cure" an addiction to cigarettes. In fact, this is nothing but the ingestion of nicotine in another form. Instead of inhaling the nicotine along with the other ingredients in tobacco into the lungs, the alkaloid nicotine is extracted and isolated and then reintroduced into the body through the stomach and intestines or skin. Tobacco addiction has not been "cured" because tobacco addiction is primarily an addiction to the nicotine. True, the "patient" is no longer smoking cigarettes, but the very reason for smoking the cigarettes in the first place was the nicotine in the tobacco. What has really been achieved? It would be more honest to market the

---

<sup>26</sup> Grob, Gerald N., editor. Public Policy and the Problem of Addiction: Four Studies, 1914-1924. New York, NY: Arno Press, 1981, p. 8 (GB).

<sup>27</sup> Grob, p. 1199 (GB).

<sup>28</sup> Towns, C. B. Habits that Handicap. New York, NY: Arno Press, 1981, p. 36 (GB).

<sup>29</sup> Morris, R. T. "What is a Quack? He ever applies to the public, Dr. Morris says," *New York Times*, Dec. 1, 1912, Sunday, p. 16. *New York Times Archives*.

patches and gum side by side with packets of cigarettes in the same cigarette machines. Nevertheless, many have reported success with these nicotine cures and there appears to be an undeniable benefit for the respiratory tract.

But was Lin even interested in these Western opium cures? The Canton Ophthalmic Hospital saw 809 cases during the year 1839-1840 and it lists 15 patients treated for "Opium-mania."<sup>30</sup> The treatment was the same in Canton then as it would be seventy years later in the United States:

The treatment adopted, it was added, is to pay attention primarily to any existing disorder of the digestive system or lungs (the first, as had been explained, to suffer), not wholly forbidding the accustomed indulgence until the symptoms of disease should begin to yield and the constitution to rally, - then *gradually* to diminish the quantity of opium, till it should be altogether dispensed with. To give weight to this principle of treatment, a very simple illustration was made use of, - the difference between a child being made, at the risk of life to throw itself down from a giddy and dangerous height, and its being enabled step by step to descend from it, as by a flight of stairs. It was stated, in conclusion that this gradual treatment would ordinarily, if directed against a habit of long standing, require a period extending from two or three months to a year or two; and that some cases would occur for which recovery could not be anticipated.<sup>31</sup>

The Commissioner specifically asked Dr. Peter Parker of the Ophthalmic Hospital for information regarding Western opium cures in July of 1839 (*italics added*):

An expose of views in regard to opium was also desired, and a *general prescription for the cure* of those who had become victims to its use. In reply to this, an explanation was written in Chinese, to the effect that opium was classed among the poisons by scientific men of the West, but at the same time, like arsenic and other powerful articles of the materia medica, is a valuable medicine in the hands of the skillful physician - that, when taken in excessive doses, it is capable of producing death in two ways, - first, by its effects upon the heart and circulating system, producing apoplexy; and secondly, by its

<sup>30</sup> *CR*, vol. 8, p. 630 (MD).

<sup>31</sup> *CR*, vol. 8, p. 635-636 (MD), *italics original*.

effects upon the brain and nervous system. Two instances were cited, in which the physician had been called to attend men who have used opium as a means of self-murder; these were given as affording evidence of the effects upon the circulating system. Some explanation was also afforded, of the manner in which by its gradual influence, the use of opium undermines the whole constitution. And it was then pointed out, that the treatment for recovery of those suffering under its use must vary, according to the quantity taken, the length of time that the habit had been formed, the age and state of constitution of the patient, and etc.; and *consequently that there was no specific*; each case must be treated according to its own particular symptoms.<sup>32</sup>

But Lin persisted with his investigation, his interest in the subject of Western cures for the opium habit unabated:

These explanations did not satisfy the commissioner: he was not content to believe, that there was no specific; and he sent a second time to desire some compound, so many mace or candareens' weight of this and that article, to be take as a substitute by those addicted to opium, and to be gradually reduced in quantity till perfect rescue from the evil should be effected.<sup>33</sup>

There is an obvious possibility here that Lin may simply have been checking on the state of the medical knowledge of the foreigners as regards opium cures. Indeed, Dr. Parker spends the next page and a half in a long and intricate tale that takes place over months, of trusses, old friends from Peking, possible spies, inquisitive younger brothers, concealment of identities, mutual suspicion, and "a fear pervading all ranks."<sup>34</sup> Nor would this have been strange considering the state of Barbarian-Chinese affairs during this period.

## 2. IN CHINA

In China just as in the West, there were many who addressed the issue of opium "addiction" and how to "cure" it. On his first

---

<sup>32</sup> *CR*, vol. 8, p. 635 (MD).

<sup>33</sup> *CR*, vol. 8, p. 636 (MD).

<sup>34</sup> *CR*, vol. 8, pp. 636-637 (MD).

voyage to China in 1831, the missionary Gutzlaff dispensed cures for opium-smoking but does not say what they contained:

From my severe remarks on their conduct [opium-smoking], they concluded I had some remedy for the use of the drug, and intimated their opinion to others. ... Some experiments which I made to cure the habit of opium-smoking proved so successful that they attracted general notice, and drew the attention of some mandarins, who even stopped to pay me a visit, and to request my aid, stating that his imperial majesty was highly enraged, because so many of his subjects indulged in this practice.<sup>35</sup>

In January 1839 Governor-General Teng wrote to the emperor on his progress in stopping the practice of opium smoking. The Governor has a remedy but does not say exactly what it contains (*italics added*):

As to the dissemination of *medical prescriptions* for abstinence from smoking, he reported that progress was manifest: there had been 10,158 opium pipes surrendered to the government.<sup>36</sup>

Shen Chi-hsien, Governor of Shansi, also has some kind of cure but isn't sure it works (*italics added*):

Given the period of one year, and shown the *remedial directions*, it needs not be feared that people will refuse to correct their bad habit. But, it must not be forgotten, the foolish multitude often seek to get by according to their desire for the immediate present, and rarely care for what is to follow .... Moreover, we do not know whether the *remedial directions* are effective. Should they prove ineffective after being applied for one year, are we really to have the guilty all executed?<sup>37</sup>

Lin was also interested in Chinese opium "cures." Lin consulted the medical expert He Qiuei (1774-1837) who developed a "theory which could account for opium craving."<sup>38</sup> While still

---

<sup>35</sup> Gutzlaff (1834), pp. 128, 133.

<sup>36</sup> Kuo, p. 101.

<sup>37</sup> Kuo, pp. 78-79, quoting the CPYWSM (TK), volume 2, pages 17-20.

<sup>38</sup> Dikötter, et al., p. 105.

governor-general of Hu-Kwang province, in his second memorial to the emperor received 5 Oct 1838 Lin mentions he has cures (*italics added*):

Meantime we issued public notices of warning and erected a fund for *making large quantities of remedial drugs*. ... Agencies with trustworthy officers had been established in the provincial capital, Hankow, and other places for the purpose of collecting surrendered smoking instruments. In case the people surrendered their smoking properties completely and repented heartily, they were exempted from punishment, and *were also given the said remedial drug* in order that they might get rid of the vicious habit.<sup>39</sup>

As an aside, judging only from the juxtaposition of the sentences in the narrative, it appears that these remedial drugs are being distributed at the very same time and place at which the pipes and opium are being surrendered.

Another such Center for Surrendered Pipes and Opium was established only five months later when Lin arrives in Canton. On March 15 Lin issues his edict to the Chinese of Guangdong province, demanding they "take their opium both crude and prepared, and voluntarily deliver it up to the officers."<sup>40</sup> Attached is the second edict from Lew, chief mandarin of the Nanhai district, who opens a public depot for this purpose "within the precincts of the western pass, near the temple of longevity."<sup>41</sup> Shuck (1840) adds that this is "where vats were dug during 1839 for destroying opium."<sup>42</sup> Taken together, this suggests that Lin was manufacturing these remedial drugs from surrendered opium as early as October 1838. Against this, Lin explicitly tells the emperor that in 1838 he "broke them with a sword and burned them with fire" (an expression that sounds curiously metaphorical), and mixed the oily matters "with wu-tung oil, thoroughly burned them, and threw them away into the midst of the rivers."<sup>43</sup> As well, Kuo's translation of Lin's memorial of

---

<sup>39</sup> Kuo, p. 81.

<sup>40</sup> Shuck, p. 59 (GB).

<sup>41</sup> Shuck, p. 80 (GB).

<sup>42</sup> Shuck, p. 179 (GB), *italics* Shuck.

<sup>43</sup> Kuo, p. 81.

October 1838 states that the people of Hu-Kwang were (*italics added*) "*given the said remedial drug*"<sup>44</sup> when they surrendered their pipes and opium, not that the drug was sold to them. Where they refilled their prescriptions Lin doesn't tell the emperor.

In March 1839, Lin even proposed that the people of Guangdong province try a different addiction to replace that of smoking opium (*italics added*):

It is said that in these regions there are pestiferous exhalations, the injurious effects of which can be entirely avoided by the use of *betel-nut and dried tobacco*; and to abridge your expenditures for something which is exactly suitable to your mouths, and which furthermore does not violate the prohibitory regulations, why not therefore exchange that (opium) for these?<sup>45</sup>

Lin approves of the use of tobacco and betel, opposes the use of opium and has nothing whatsoever to say about the widespread use of distilled liquors.<sup>46</sup>

What was in these remedial drugs? In 1838, Lin enclosed for the emperor

a six-page treatise, compiled from the best medical works, explaining the use of several drugs likely to help those who were trying to cure themselves of the opium habit. Some of the ingredients were *Atractylis ovata*, *Angelica polymorpha*, *Lignum aloes*, *Gastrodia elata* (a kind of orchid) and *Astible* (a kind of saffron).<sup>47</sup>

Other popular Chinese opium cures included goat droppings and a diet high in lecithin.<sup>48</sup>

But what else was in these cures for opium addiction besides herbs? Just as in the West, opium cures in the East often contained opium or its alkaloids. According to Dikötter, Laamann and Xun,

---

<sup>44</sup> Kuo, p. 81.

<sup>45</sup> Shuck, p. 18.

<sup>46</sup> See for example the comments of Bingham, pp. 230, 321.

<sup>47</sup> Waley, p. 14.

<sup>48</sup> Dikötter, et al., p. 140.



these remedial drugs contained opium dross and appeared in local drug stores in Canton during Lin's tenure there (*italics added*):

Prohibition engendered a lucrative industry in opium cures, which more often than not contained large amounts of opium dross and had adverse medical consequences for their users. *These already appeared in the wake of the anti-opium movement launched by Lin Zexu in Guangdong during the first Sino-British War (1839-1842).* Lin proposed the use of anti-acidic pills (*jisuanu'an*) and restorative tonics (*buzhengwan*), consisting of a mixture of opium dross and a variety of herbs, to eliminate opium cravings (*yin*). *These medications were officially endorsed and openly sold in local drug stores, leading in the region where Lin Zexu imposed a ban on opium, to long queues of prospective customers.*<sup>49</sup>

Effectively, Lin has identified a problem that had not previously existed (opium-smoking) and then offered the solution of a remedial drug based on opium dross, using both carrots and sticks (*italics added*):

While the popularity of these remedies appears to point at an existing demand for detoxification treatment, *most consumers may well have been more interested in buying legal remedies containing opium dross than in seeking medical help.* Opium substitutes were not only legal but also proved to be cheaper.<sup>50</sup>

And where would Lin have obtained suddenly such a large quantity of cheap opium dross? Dross would have been the "undesirable" parts of the opium. Lin writes to the emperor that the purifiers noticed "that when mixed with salt and lime in the process of purification, the opium will never yield the oily paste desired."<sup>51</sup> Assuming it is the oily paste desired, the siftings would have been therefore undesirable, or dross. Lin can obtain his dross through his processing of confiscated Chinese and foreign opium. This alkaloid-rich dross could then have been sold to those suffering the consequences of opium withdrawals as a remedial drug. There is no

<sup>49</sup> Dikötter, et al., p. 119.

<sup>50</sup> Dikötter, et al., p. 119.

<sup>51</sup> Kuo, p. 245.

evidence Lin did so, only that he proposed and approved of these remedies and that these so-called "cures" based on opium dross were sold in Guangdong while he was there. Without the signed receipts it would be unfair to state that he sold them.

If Lin had done this, he would have been the first of many. Foreign medical "experts" arrived in China via the treaty ports later in the century (*italics added*):

Between 1850 and 1895, large quantities of opium replacement medications were imported into the country. ... Pills in particular became popular, leading to a shift away from opium smoking towards opiate ingestion .... Having constructed an image of the opium smoker as a physical degenerate and morally depraved addict under the yoke of physical dependence, medical missionaries could proceed to rescue him .... *Most opium cures contained liberal quantities of opium.*<sup>52</sup>

By the late 1880s and 1890s sales were booming. One medical missionary commented, "The nostrums of the native doctors are innumerable, and anti-opium medicines presented by foreigners are eagerly sought for."<sup>53</sup> One Shanghai expert offered his own

patent 'modern' medicines, including morphine-based 'natural pills for breaking the opium habit' (*tianran jieyanwan*). This pill alone generated an annual profit of more than 100,000 yuan. Other commercial dispensaries also benefitted from selling opium remedies based on morphine.<sup>54</sup>

### C. DISCUSSION

Though admittedly thick with speculation, and not directly germane to the extraction of the alkaloids itself, there is enough of a connection here to suggest future lines of inquiry. The opium is worth a literal fortune, as a mandarin he must turn a profit on every enterprise and his chosen production method is expensive. So it is not too much of a stretch to suggest that Lin expects a return on his

---

<sup>52</sup> Dikötter, et al., pp. 119-120.

<sup>53</sup> Dikötter, et al., p. 120.

<sup>54</sup> Dikötter, et al., p. 152.

investment. Since he would not have wanted to destroy what he had so painstakingly produced, Lin could have sold his morphine-rich sediment either directly or as an opium cure, a legal substitute for the illegal opium he had just confiscated.

Lin proposed and approved of remedial drugs, opium cures, many of which were based mainly on opium dross. One example of dross would be the residue obtained from his own chemical processing of the opium. There is evidence that he distributed remedial cures when governor-general of Hu-Kwang; what exactly they were composed of is not stated. These cures appeared in Guangdong province in the wake of the prohibition imposed by Lin and others.

Together, this suggests that Lin's morphine-rich sediment was also sold to the Chinese of Guangdong province as a remedial cure. There is the coincidence of these "cures" for opium addiction becoming widespread while he was in Guangdong province. There is evidence that Lin proposed the use of tonics containing opium dross, that these products were officially endorsed (by whom it is unstated) and openly sold in drug stores as a result of his enforcement of the bans on opium, that they were legal and cheaper than buying opium. The sudden appearance of so-called remedies for opium addiction based on dross during his tenure suggests an obvious source for making "large quantities of remedial drugs," that is, the confiscated opium itself, domestic and foreign. While such a scenario fits the assembled evidence, it needs to be restated that although he proposed and approved of such cures, there is no direct evidence that Lin sold them or benefitted from the sales of any such products in any way.

Had he done so, of course, his would have been only the forerunner of many such enterprises in the 19th and early 20th centuries, all marketing substitutes for opium that were themselves based on opium, opium dross, opium alkaloids or morphine.

## XXV CONCLUSION

---

*EVERY* investigation, like every war, needs an exit strategy. Whether or not this one has been convincing, it has proposed an hypothesis (that Lin could have extracted the alkaloids from the confiscated opium), attempted to gather evidence to support or deny it, and along the way tried to ask some intelligent questions. The ball is now in the court of those who still maintain in the face of this collection of evidence that Lin destroyed the opium to explain why a Chinese in Canton using very similar knowledge, ingredients, equipment, and methods as a European in Paris, London or Edinburgh destroys opium while the latter extract from it the morphine.

Summarizing, in parts one and two the basic legendary and historical evidence was presented. Again, to paraphrase Lin, only by knowing what is false can one be certain of what might be true. First it was important to acknowledge Lin as hero and symbol and examine the origins of various tales of what Lin did not do. At least five different stories have grown up around the event, the most popular of which is The Burning Tale.

Second, within this context were presented the origins, both official and eyewitness, of various versions of the tale of what he did. The different eyewitness accounts were examined closely for context, similarities and differences. After examining multiple translations and the original documents, it should be clear that the problem is neither linguistic nor some kind of cultural misunderstanding but that a true change of language precedes a true change of method.

In part three, the basic chemical evidence was presented showing water, lime and salt can be and have been used to extract the alkaloids from opium. Chemists over three centuries have used and continue to use techniques to extract morphine from opium very similar to the method Lin used. Nineteenth century chemists

experimented with various salts and compounds of calcium including lime to extract morphine and other alkaloids. Lime plays a part in all three of the so-called classic method of extracting morphine from opium. Lime in particular has been used to extract any number of alkaloids, including caffeine and cocaine, from natural plants. Lime plays a role in traditional alkaloid extraction (but not isolation). In the process of confirming the nature of morphine in the plant, a number of chemists extracted the alkaloid using common salt. Salt and lime are used as well as in food preservation and preparation.

In part four, Lin's knowledge, ingredients, equipment and several possible recipes were examined from the standpoint of a commercial scale, batch-process alkaloid extraction. Lin could have accomplished the extraction of all of the principal alkaloids and may even have been able to produce a modern morphine base. The result of his process, the remnants, residue, siftings or dross was considered within the framework of sales of Chinese cures for opium addiction. Lin was interested in such remedies, knew of them, approved of them, immediately after his processing of the foreign opium in July 1839 specifically asked Dr. Parker for Western recipes, and such remedies were sold in the wake of his own prohibitory efforts. No evidence was presented that Lin himself benefitted financially from the sale of these remedies.

At this point it is possible to present the minimal case. Lin did not burn, drown, chase away, bury or plaster the opium. The confused origins of these tales mostly began with Lin and have continued to this day. He said he would burn it. He changed his mind. He soaked the opium in water, salt and quicklime. Water, salt and lime were ingredients in Western recipes for extracting opium alkaloids, primarily morphine. Lin stirred his mixture in large tanks, separated it into two parts, a floating oil and a sinking residue. He said he would discharge the dregs to the sea. He changed his mind. He filtered the liquid, retaining the dregs. Opium cures were sold in Guangdong province during his tenure, popular in the wake of his own prohibitionist measures. Lin knew and approved of these remedies. Many opium cures contained either opium or dross.

What evidence would strengthen this case? Eyewitness Chinese accounts of the dregs being saved, an exact recipe for morphine extraction from opium, either Western or Eastern that precisely describes Lin's method, a translated Western volume giving such a recipe that Lin had read, an Eastern volume read by a purifier, inventories or accounts showing the transfer of Lin's dregs to the makers of opium cures, receipts for opium cures sold in Guangdong province signed by Lin, and a laboratory analysis of such cures would help.

What evidence would weaken this case? Eyewitness Chinese accounts that the dregs were sent to the sea along with the liquid or were destroyed in some other manner, an analysis that said opium cures did not contain either opium or dross, and experimental evidence that opium, water, salt and quicklime cannot precipitate opium alkaloids would be useful. The latter is considered in more detail in appendix E.

The examination of events nearly two hundred years old can only be admitted as speculation and nothing more. Nevertheless, good judgment and the accumulated evidence support an hypothesis that Commissioner Lin could have extracted the morphine from the barbarian opium in June, 1839.

Why? Briefly, Lin does not burn the opium. He chooses a method whereby the alkaloids may be preserved. Lin had the knowledge, ingredients, equipment and a recipe for extracting the opium alkaloids into a morphine-rich residue. Many similar Western processes of alkaloid extraction over three centuries used similar ingredients and similar methods, producing a morphine-rich residue not a destruction. A close examination of what is known of his stated method and the design of his equipment reveals that Lin could have precipitated the opium alkaloids either floating in or as a residue on the bottom of at least one of his tanks, yielding an alkaloid-rich but probably not morphine-exclusive sediment or dross, a coffee colored brown powder similar to what is known as *p'î-tzu*. This result could have been captured by his filter. This legal opium dross could then have been sold in Guangdong province mixed with many herbs as a remedial drug to replace the illegal and confiscated opium.

The Appendices to volume two contain some background chemistry, speculation, secondary perspectives, and more questions.

So, *amigo mio*, did Lin make morphine? I suggest a footnote be added to any future discussion of the 19th century prohibition of Chinese opium to the effect that good evidence has been presented that Lin Zexu may not have destroyed the foreign opium in June of 1839, could have extracted a predominantly morphine base, and may even have sold it mixed with many herbs as an opium cure.

G. W. Robinette

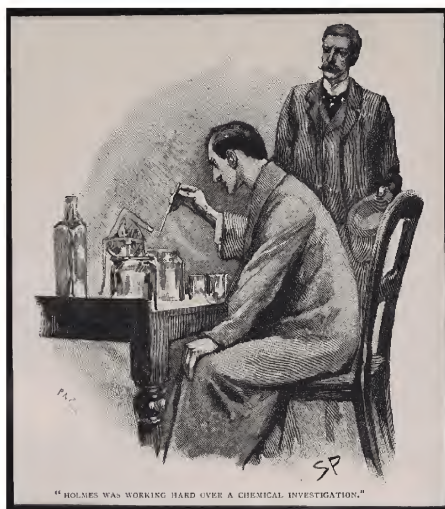
Valparaiso, 29 Feb 2008

## APPENDICES

### Vol. II

---

The appendices to volume two contain material interesting and germane but not essential for an understanding of what Lin may or may not have done with the confiscated opium in June of 1839.







## APPENDIX D CHEMISTRY

---

### APPENDIX D. CHEMISTRY

#### A. DEFINITIONS

1. ACIDS
2. BASES
3. SALTS
4. THEORIES OF ACIDS AND BASES
5. MEASURING ACIDS AND BASES
6. AMPHOTERISM
7. SOLUTIONS
8. REACTIONS
9. PRECIPITATION
10. CRYSTALLIZATION
11. AMINES
12. PHENOLS

#### B. ALKALOIDS

1. POPPY ALKALOIDS
2. MORPHINE
  - a. DESCRIPTION AND PHARMACOLOGY
  - b. FORMULA AND STRUCTURE
  - c. EXTRACTION AND ISOLATION

*W*ITHIN certain parameters the following concepts may be of some value. This information may help provide a certain amount of background and context for the chemical evidence that has already been presented.

## APPENDIX D

### A. DEFINITIONS

#### 1. ACIDS

Acids were first classified according to taste. Acids are often described simply as "a class of substances that taste sour, such as vinegar, which is a dilute solution of acetic acid."<sup>1</sup> Classifying substances by their sour taste shows up early in Medieval alchemy (*italics added*):

The English word acid, the French *acide*, the German *Säure*, and the Russian *kislota* are all derived from words meaning sour (Latin, *acidus*, German *sauer*, Old Norse *suur*, and Russian *kisly*). Other properties associated at an early date with acids were their solvent, or corrosive, action; their effect on vegetable dyes; and *the effervescence resulting when they were applied to chalk* (production of bubbles of carbon dioxide gas).<sup>2</sup>

More generally, acids are "chemical compounds that show, in water solution, a sharp taste, a corrosive action on metals, and the ability to turn certain blue vegetable dyes red."<sup>3</sup>

Examples of strong acids are hydrochloric (HCL), nitric (HNO<sub>3</sub>) and sulfuric (H<sub>2</sub>SO<sub>4</sub>).<sup>4</sup> Phosphoric acid (H<sub>3</sub>PO<sub>4</sub>) "is classified as a moderate acid. Carbonic acid (H<sub>2</sub>CO<sub>3</sub>), the acid in carbonated drinks, and acetic acid (HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>), the acid in vinegar ... are called weak acids."<sup>5</sup>

---

<sup>1</sup> "Guru's Big Guide to Chemistry," p. 1, found at [www.poppies.org](http://www.poppies.org).

<sup>2</sup> Bell, Ronald P., editor. "acid-base reaction," *Encyclopaedia Britannica*. EB Online, 04/01/2008, <http://search.eb.com/eb/article-49247>, p. 1.

<sup>3</sup> Bell, Ronald P., editor. "acid-base reaction," *Encyclopaedia Britannica*. EB Online, 04/01/2008, <http://search.eb.com/eb/article-49247>, p. 1.

<sup>4</sup> *Ibid.*, p. 2; Clark, Ronald D. and Amai, Robert L. S. *Chemistry*. Santa Barbara, CA: Hamilton Publishing Co., 1975, p. 169.

<sup>5</sup> Clark, pp. 169-170.

## CHEMISTRY

### 2. BASES

Bases were also classified early according to their taste, not sour but bitter. Bases, or alkaline substances (also called alkalies) such as baking soda ... are characterized by their bitter taste and slippery feel (when in water): "Bases are chemical compounds that, in solution, are soapy to the touch and turn red vegetable dyes blue."<sup>6</sup>

Examples of strong bases are sodium hydroxide (NaOH), potassium hydroxide (KOH) and calcium hydroxide (Ca(OH)<sub>2</sub>).<sup>7</sup> The latter is also known commonly as *slaked lime*.<sup>8</sup> Ammonium hydroxide (NH<sub>4</sub>OH) "is termed a weak base."<sup>9</sup> Bases neutralize acids, forming salts.

### 3. SALTS

Salts were originally classified by taste as well:

When mixed, acids and bases neutralize one another and produce salts, substances with a salty taste and none of the characteristic properties of either acids or bases. ... Bases (or alkalies) were characterized mainly by their ability to neutralize acids and form salts, the latter being typified rather loosely as crystalline substances soluble in water and having a saline taste.<sup>10</sup>

A salt then is "the product of the reaction between an acid and a base."<sup>11</sup> The combination of an acid and a base is called an "acid/base (aka A/B)"<sup>12</sup> extraction or an acid-base reaction. Almost everyone has felt an acid-base extraction at least once:

---

<sup>6</sup> Bell, Ronald P., p. 1.

<sup>7</sup> "Guru's," p. 2.

<sup>8</sup> DEA-20026, p. 10.

<sup>9</sup> Clark, p. 170.

<sup>10</sup> Bell, Ronald P., p. 1.

<sup>11</sup> "Guru's," p. 2.

<sup>12</sup> "Guru's," p. 2.

## APPENDIX D

Indigestion often results from excess acid in the stomach. ... Substances such as bicarbonate of soda and Alkaseltzer are bases .... Such acid-base reactions are called neutralization reactions and produce compounds called salts.<sup>13</sup>

Alkaseltzer 2 and Di-gel use aluminum hydroxide ( $\text{Al}(\text{OH})_3$ ) as its common anti-acid but TUMS uses powdered calcium carbonate ( $\text{CaCO}_3$ ), the principal component of limestone.<sup>14</sup> Besides forming salts,

these reactions have a common product, water. ... (Since) most resulting salts remain in solution as ionic species, the only true product is water. ... Evaporation of the water from neutralization-reaction mixtures would yield residues of the various salts.<sup>15</sup>

Salts can be classified as acidic, basic or neutral:

Strong Acid + Strong Base  $\rightarrow$  Neutral Salt + water

Strong Acid + Weak Base  $\rightarrow$  Acidic Salt + water

Weak Acid + Strong Base  $\rightarrow$  Basic Salt + water

Weak Acid + Weak Base  $\rightarrow$  (Acidic, Basic, or Neutral) Salt + water.<sup>16</sup>

Examples of salts include the salt everyone is familiar with, table salt or common salt, sodium chloride ( $\text{NaCl}$ ), as well as sal ammoniac (ammonium chloride,  $\text{NH}_4\text{Cl}$ ), saltpetre, alum and borax.

---

<sup>13</sup> Clark, p. 168.

<sup>14</sup> Burns, Ralph A. *Fundamentos de Química*. 2nd ed. Naucalpan de Juarez, Mexico: Prentice-Hall Hispanoamericana, S. A., 1996, p. 484.

<sup>15</sup> Clark, pp. 168-169.

<sup>16</sup> "Guru's," p. 2.

## CHEMISTRY

### 4. THEORIES OF ACIDS AND BASES

The interactions of acids and bases to form salts have generated a number of popular theories over the last two centuries. Classified by the Theory of Taste, sour and bitter are opposites and when combined, balance one another and make a new taste, saline or salty. Chemists in the early 19th century relied upon the Theory of Affinities, noticing that some substances united more easily than others. They made lists of the categories and conditions under which one element would combine with another depending upon the presence or not of a third. In this manner, they accumulated a wealth of detailed, practical experience, bridging the canyon between the qualitative and the quantitative (*italics added*):

(T)he ability of a fixed quantity of acid to neutralize a fixed quantity of base was one of the earliest examples of chemical equivalence: the idea that a certain measure of one substance is in some chemical sense equal to a different amount of a second substance. In addition, it was found quite early that one acid could be displaced from a salt with another acid, and this made it possible to *arrange acids in an approximate order of strength*.<sup>17</sup>

Early attempts at a unified theory began with an attempt to explain acids:

The first attempt at a theoretical interpretation of acid behaviour was made by Antoine-Laurent Lavoisier at the end of the 18th century. Lavoisier supposed that all acids must contain oxygen, and this idea was incorporated in the names used for this element in the various languages: the English oxygen, from the Greek *oxys* (sour) and *genna* (production); the German *Sauerstoff*, literally acid material; and the Russian *kislород*, from *kislota* (acid).<sup>18</sup>

Unfortunately, hydrochloric acid contained no oxygen.

---

<sup>17</sup> Bell, R. P., pp. 1-2.

<sup>18</sup> Bell, Ronald P., editor. "acid-base reaction," *Encyclopaedia Britannica*. EB Online, 04/01/2008, <http://search.eb.com/eb/article-49247>, p. 2.

## APPENDIX D

Sir Humphrey Davy in about 1815 first recognized that the key element in acids

was hydrogen. Not all substances that contain hydrogen, however, are acids, and the first really satisfactory definition of an acid was given by Justus von Liebig of Germany in 1838. According to Liebig, an acid is a compound containing hydrogen in a form in which it can be replaced by a metal. This definition held the field for about 50 years and is still considered essentially correct, though somewhat outmoded. At the time of Liebig's proposal, bases were still regarded solely as substances that neutralized acids with the production of salts, and nothing was known about the constitutional features of bases that enabled them to do this.<sup>19</sup>

With the ability to measure accurately with magnetism and electricity, physicists absconded with chemistry toward the end of the 19th and early 20th centuries:

Three major theories of acids and bases have been proposed and used throughout the history of chemistry, and each successive theory has been broader in scope than the previous one.<sup>20</sup>

Briefly, these are the Ostwald-Arrhenius, the Bronsted-Lowry, and the Lewis theories which classify acids and bases according to their ions, protons and electron pairs.

### a. THE ARRHENIUS THEORY

Wilhelm Ostwald and Svante Arrhenius in 1887 proposed a more rigorously quantitative definition of the difference between acids and bases. They did this "by defining acids and bases according to the effect these substances have on water."<sup>21</sup> When dissolved in water, an acid is a "substance that ionizes ... to produce hydrogen ions (H<sup>+</sup>). A base was defined by the (Ostwald-Arrhenius)

---

<sup>19</sup> Bell, Ronald P., editor. "acid-base reaction," *Encyclopaedia Britannica*. EB Online, 04/01/2008, <http://search.eb.com/eb/article-49247>, pp. 2-3.

<sup>20</sup> Clark, p. 166.

<sup>21</sup> "Guru's," p. 1.

## CHEMISTRY

concept as a substance that ionizes in water to produce hydroxide ions ( $\text{OH}^-$ )."<sup>22</sup>

The principal feature of this theory is that certain compounds, called electrolytes, dissociate

in solution to give ions. With the development of this theory it was realized that acids are merely those hydrogen compounds that give rise to hydrogen ions ( $\text{H}^+$ ) in aqueous solution. It was also realized at that time that there is a correspondence between the degree of acidity of a solution (as shown by effects on vegetable dyes and other properties) and the concentration of hydrogen ions in the solution. Correspondingly, basic (or alkaline) properties could then be associated with the presence of hydroxide ions ( $\text{OH}^-$ ) in aqueous solution, and the neutralization of acids by bases could be explained in terms of the reaction of these two ions to give the neutral molecule water ( $\text{H}^+$  and  $\text{OH}^-$  yield  $\text{H}_2\text{O}$ ). This led naturally to the simple definition that acids and bases are substances that give rise, respectively, to hydrogen and hydroxide ions in aqueous solution.<sup>23</sup>

In water, the hydrogen ion ( $\text{H}^+$ ) "is not just a bare proton, it is a proton bonded to a water molecule,  $\text{H}_2\text{O}$ . This results in a hydronium ion,  $\text{H}_3\text{O}^+$ ."<sup>24</sup> Other exceptions such as variations in the type of ion from solvent to solvent and that some solvents showed few free ions and some bases no hydroxyl groups, led to a more generalized definition.

### b. THE BRONSTED-LOWRY THEORY

In order to "resolve the various difficulties in the hydrogen-hydroxide ion definitions of acids and bases, a new, more generalized definition was proposed in 1923 almost simultaneously by J. N. Bronsted (Denmark) and T. M. Lowry (Britain)."<sup>25</sup> This theory

---

<sup>22</sup> Clark, p. 166; "Guru's," p. 1.

<sup>23</sup> Bell, Ronald P., editor. "acid-base reaction," Encyclopaedia Britannica. EB Online, 04/01/2008, <http://search.eb.com/eb/article-49247>, p. 3.

<sup>24</sup> "Guru's," p. 1.

<sup>25</sup> Bell, R. P. "acid-base reaction," Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-49247>.



## APPENDIX D

classifies acids and bases according to whether they donate or accept protons. In this more general theory, regardless of what they are dissolved in, "an acid is any substance donating hydrogen ions (protons) in a chemical reaction and ... a base is any substance accepting hydrogen ions (protons) in a reaction."<sup>26</sup> Acids donate protons; bases accept them (*italics added*):

The term proton means the species  $H^+$  (the nucleus of the hydrogen atom) rather than the actual hydrogen ions that occur in various solutions; the definition is thus independent of the solvent. The use of the word species rather than substance or molecule implies that the terms acid and base are not restricted to uncharged molecules but apply also to positively or negatively charged ions. ... The ions derived from the solvent ( $H_3O^+$  and  $OH^-$  in water and  $NH_4^+$  and  $NH_2^-$  in liquid ammonia) are not accorded any special status but appear as examples of acids or bases in terms of the general definition. ... *Molecules such as ammonia and organic amines are bases by virtue of their tendency to accept a proton.* With metallic hydroxides such as sodium hydroxide, on the other hand, the basic properties are due to the hydroxide ion itself, the sodium ion serving merely to preserve electrical neutrality.<sup>27</sup>

### c. THE LEWIS THEORY

"This definition was first proposed by the American chemist Gilbert N. Lewis also in 1923."<sup>28</sup> The Lewis theory is based not on water or protons but on electron pairs: "an acid is a species that accepts an electron pair in a chemical reaction and a base (is) a species that donates an electron pair in a reaction."<sup>29</sup> Acids accept electron pairs; bases donate them, exactly the reverse of what they do with protons:

---

<sup>26</sup> Clark, p. 167.

<sup>27</sup> Bell, R. P. "acid-base reaction," *Encyclopaedia Britannica*. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-49247>.

<sup>28</sup> Bell, R. P. "acid-base reaction," *Encyclopaedia Britannica*. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-49247>.

<sup>29</sup> Clark, p. 167-168.

## CHEMISTRY

This classification includes as bases the same species covered by the Bronsted-Lowry definition, since a molecule or ion that can accept a proton does so because it has one or more unshared pairs of electrons, and therefore it also can combine with electron acceptors other than the proton. On the other hand, the typical Lewis acids need not (and usually do not) contain protons ....<sup>30</sup>

In many cases there will be little significant difference between the Bronsted-Lowry and Lewis definitions. One difference occurs when discussing oxidation-reduction reactions:

In oxidation-reduction reactions one or more electrons are transferred completely from the reducing agent to the oxidizing agent, whereas in a Lewis acid-base reaction an electron pair on the base is used to form a covalent link with the acid.<sup>31</sup>

"Based on the most general theory, it has been suggested that any chemical reaction that is not an oxidation-reduction reaction is an acid-base reaction."<sup>32</sup>

### 5. MEASURING ACIDS AND BASES

Some acids are stronger than others, as are some bases. "The acidic strengths or properties of compounds are not all equal, nor are their basic strengths or properties."<sup>33</sup> Besides classifying them as simply strong, moderate, or weak, again it is possible to be more exact:

In Arrhenius's theory, something that is a strong acid is a substance that completely ionizes in aqueous solution to give a hydronium ion,  $\text{H}_3\text{O}^+$ , and an

---

<sup>30</sup> Bell, R. P. "acid-base reaction," Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-49247>.

<sup>31</sup> Bell, R. P. "acid-base reaction," Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-49247>.

<sup>32</sup> Clark, p. 166.

<sup>33</sup> Clark, p. 169.

## APPENDIX D

anion. An anion is a negatively charged ion. ... (A) strong base ... is something that completely ionizes in aqueous solution to give a hydroxide ion and a cation. A cation is a positively charged ion. ... Weak acids (like weak bases) do not completely ionize in solution, but exist in equilibrium.<sup>34</sup>

For example, the acid in vinegar, acetic acid ( $\text{HC}_2\text{H}_3\text{O}_2$ ) is only slightly ionized in water and so is called a weak acid. "These (weak) acids exist more predominantly as molecules rather than as ions in water."<sup>35</sup> The relative acidity or basicity of a solution depends upon the ratio of positive to negative ions:

When the terms acidity or basicity are applied to aqueous solutions of substances, the criterion determining these properties is the relative concentration of hydrogen ions to hydroxide ions .... Whichever ion is in greater concentration will determine the overall acidic or basic nature of the solution. The greater the difference ... the more acidic or basic the solution ... In pure water, the concentrations of both ions are equal; therefore, pure water is neither acidic nor basic, but is neutral.<sup>36</sup>

The pH scale is commonly used to compare acidity or alkalinity (basicity) of a solution. The pH scale "is a logarithmic measure of hydrogen ion concentration, originally defined by Danish biochemist Soren Peter Lauritz Sorensen in 1909."<sup>37</sup> According to this scale, the "more acidic a solution, the lower is its pH and the more basic (or alkaline) it is, the higher is its pH."<sup>38</sup> Pure water is defined as neutral on the scale, which is seven.

For example, a solution of pH 1 is said to be 10 times as acidic as a solution of pH 2, because the hydrogen ion concentration at pH 1 is ten times the hydrogen ion concentration at pH 2. This is correct as long as the solutions being compared both use the same solvent. You can't use pH to compare the acidities

---

<sup>34</sup> "Guru's," p. 1.

<sup>35</sup> Clark, pp. 169-170.

<sup>36</sup> Clark, p. 170.

<sup>37</sup> "Guru's," p. 2.

<sup>38</sup> Clark, p. 170.

## CHEMISTRY

in different solvents because the neutral pH is different for each solvent. For example, the concentration of hydrogen ions in pure ethanol is about  $1.58 \times 10^{-10}$  M, so ethanol is neutral at pH 9.8. A solution with a pH of 8 would be considered acidic in ethanol, but basic in water! Just as a rule of thumb.... Acids are "Low" on the pH scale and bases are "High." Normal pH readings are from 0-14.<sup>39</sup>

Using this scale, one can compare the acidity or alkalinity of various substances:

Item	pH
0.1 M Hydrochloric acid (HCL)	1.0
Stomach content	2.0
Lemon juice	2.0-2.3
Vinegar	2.4-3.4
Wine	2.8-3.8
Soda pop	3.0
Rhubarb	3.1-3.2
Grapes	3.5-4.5
Tomatoes	4.0
Black coffee	5.0
Urine	6.0-7.0
Milk	6.5
Saliva	6.5
Pure water	7.0
Tears	7.4
Human blood plasma	7.4
Seawater	9.0
Milk of magnesia	10.0
Limewater	10.5
Household ammonia	11.0
Hair remover	12.0
Washing soda	12.0
0.1 M sodium hydroxide (NaOH)	13.0 <sup>40</sup>

---

<sup>39</sup> "Guru's," p. 2.

<sup>40</sup> Clark, p. 171; Wolfe, Drew H. *Química - General, Organica y Biologica*. 2nd ed. Mexico, D.F.: McGraw-Hill, 1996, trans. Maria del Consuelo Hidalgo Mondragon (orig. *Essentials of General, Organic and Biological Chemistry*), p. 178-179.

## APPENDIX D

Acids have low numbers and bases high numbers on the pH scale. Those who have or have worked with swimming pools are familiar with adjusting the pH of the water, perhaps by adding sodium hypochlorite ( $\text{NaOCl}$ ) which decomposes in water to form chlorine ( $\text{Cl}$ ) and sodium hydroxide ( $\text{NaOH}$ ). The chlorine kills the bugs but the

sodium hydroxide ( $\text{NaOH}$ ) concentration in the water increases to the point that the pH of the solution becomes too high for safe swimming. Muriatic acid (industrial hydrochloric acid ( $\text{HCl}$ )) then is added in small quantities to lower the pH to near neutral (pH of 7).<sup>41</sup>

In practice, there are a variety of methods used to determine the acidity or alkalinity of a solution. An incredibly simple indicator is chopped red cabbage leaves soaked in hot water for an hour:

The purple solution that is obtained will turn reddish when treated with an acid such as vinegar. When treated with a base such as household ammonia, it will turn bluish and then green.<sup>42</sup>

Probably, the method of measuring acids and bases most familiar to secondary school students is the litmus test. Litmus is a "product of lichens which grow on rocks and tree trunks"<sup>43</sup> and, when impregnated on a strip of paper, indicates red when dipped in an acid and blue when dipped in a base.

A number of other indicators can also be used:

<u>Indicator</u>	<u>Acid Color</u>	<u>Basic Color</u>	<u>pH Range</u>
Methyl Orange	red	blue	3-4.4
Congo Red	blue	red	3-5
Litmus	red	blue	5-8
Bromethymol blue	yellow	blue	6-7.5
Phenolphthalein	colorless	red	8.3-10
Alizarin yellow	yellow	lilac	10-12 <sup>44</sup>

---

<sup>41</sup> Clark, p. 171.

<sup>42</sup> Clark, p. 172.

<sup>43</sup> Clark, p. 171.

<sup>44</sup> Clark, p. 171.

## CHEMISTRY

### 6. AMPHOTERISM

Some substances act both as acids and bases, partially understood by the middle of the 19th century:

There are substances which act the part of acids in relation to very strong bases, and the part of bases in relation to powerful acids. It will therefore be seen, that there is nothing absolute in the definition of acids and bases, since the same substance may, according to the circumstances, assume the character of an acid or a base.<sup>45</sup>

These substances are said to be amphoteric (from Greek *amphoterōs*, "in both ways").<sup>46</sup>

Amphoterism (says the Encyclopaedia Britannica) is

in chemistry, reactivity of a substance with both acids and bases, acting as an acid in the presence of a base and as a base in the presence of an acid. Water is an example of an amphoteric substance. The dissolution of hydrogen chloride (an acid) and ammonia (a base) in water may be represented, respectively, by the following equations:

$\text{H}_2\text{O} + \text{HCl}$  forms a reversible reaction yielding  $\text{H}_3\text{O}^+$  and  $\text{Cl}^-$

$\text{H}_2\text{O} + \text{NH}_3$  forms a reversible reaction yielding  $\text{NH}_4^+$  and  $\text{OH}^-$ .

With hydrogen chloride, water accepts a proton to form a hydronium ion ( $\text{H}_3\text{O}^+$ ), while, with ammonia, water acts as a proton donor and is converted to a hydroxide ion ( $\text{OH}^-$ ). Other amphoteric substances include ammonia and the hydroxides of zinc, aluminum, chromium, lead, and tin.<sup>47</sup>

Morphine is said to be amphoteric.

---

<sup>45</sup> Regnault, M. V. Elements of Chemistry. Second edition. Vol. I. Translated by T. Forrest Betton. Philadelphia, PA: Clark and Hesser, 1853, p. 67 (GB).

<sup>46</sup> "chemical compound," Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-79431>.

<sup>47</sup> "amphoterism." Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-90000517>.

## APPENDIX D

### 7. SOLUTIONS

Solutions "are mixtures in which one substance, the *solute*, is dissolved in another, more abundant compound, the *solvent*."<sup>48</sup> In most liquid solutions, "the solvent can be removed by evaporation and the solute recovered unchanged."<sup>49</sup> Probably the simplest example would be a solution of salt (the solute) mixed in with a more abundant compound, water (the solvent). Salt, sodium chloride, "disassociates completely in water to form sodium and chloride ions."<sup>50</sup> This is written in chemical shorthand as NaCl (common salt) becomes in the presence of water sodium Na (+1) and chlorine Cl (-1) ions.<sup>51</sup>

One way chemists describe a solution (a mixture) is to say how much solute there is in a given amount of solvent. So, a five percent aqueous (watery) solution of sodium chloride contains five grams of salt in 95 grams of water. Similarly, a "45% aqueous solution of ethyl alcohol contains 45 milliliters of ethyl alcohol in 55 milliliters of water."<sup>52</sup>

### 8. REACTIONS

Consider four possibilities of combination and decomposition:

- 1) Synthesis (Direct Combination Reaction)  
A + B yields AB  
Fe + S yields FeS  
Iron and Sulfur combine to form Iron Sulfide
- 2) Decomposition Reaction  
AB decomposes to form A + B  
ZnCO<sub>3</sub> decomposes to form ZnO + CO<sub>2</sub>  
Zinc carbonate under heat gives Zinc oxide and Carbon dioxide

---

<sup>48</sup> Clark, p. 165.

<sup>49</sup> Clark, p. 166.

<sup>50</sup> Clark, p. 165.

<sup>51</sup> Clark, p. 166.

<sup>52</sup> Clark, p. 166.

## CHEMISTRY

- 3) Simple Displacement  
 $A + BC \text{ yield } AC + B$   
 $\text{Fe} + \text{CuSO}_4 \text{ yield } \text{FeSO}_4 + \text{Cu}$   
Iron and Copper sulfate form Iron sulfate and Copper
- 4) Double Decomposition  
 $AB + CD \text{ decompose and recombine to form } AD + CB$   
 $\text{KCl} + \text{AgNO}_3 \text{ break apart and then form } \text{KNO}_3 + \text{AgCl}$   
Potassium chloride and Silver nitrate together give Potassium nitrate and Silver chloride.<sup>53</sup>

Of the latter classification there are many examples:

Double Decomposition. A chemical reaction that takes place between two compounds, in which the first and second parts of one compound unite with the second and first parts, respectively, of the other compound. One of the compounds is usually insoluble. ... Sodium carbonate and calcium chloride, for example, react to form insoluble calcium carbonate and soluble sodium chloride:  $\text{CaCl}_2 + \text{Na}_2\text{CO}_3 \text{ yield } \text{CaCO}_3 + 2\text{NaCl}$ . (As another example) calcium chloride and ammonium carbonate yield calcium carbonate (insoluble) and ammonium chloride (soluble). ... The advantage of the double decomposition method is its simplicity, plus the fact that a much greater alkaline reserve can be deposited in the (filter) paper than is generally possible with most other methods.<sup>54</sup>

Calcium chloride and sodium hydroxide decompose to form calcium hydroxide and sodium chloride:  $\text{CaCl}_2 + 2\text{NaOH} \text{ yield } \text{Ca(OH)}_2 + 2\text{NaCl}$ .<sup>55</sup>

Sometimes the decomposition products are unstable:

Hydrochloric acid reacts with sodium carbonate to produce sodium chloride and carbonic acid:  $2\text{HCl} + \text{Na}_2\text{CO}_3 \text{ gives } 2\text{NaCl} + \text{H}_2\text{CO}_3$ . The carbonic acid is unstable and decomposes to form carbon dioxide gas (bubbles) and water:  $\text{H}_2\text{CO}_3 \text{ breaks apart to form } \text{CO}_2 \text{ and } \text{H}_2\text{O}$ .<sup>56</sup>

---

<sup>53</sup> From [www.syvum.com/cgi/online/mult.cgi/squizzes/chem/revct.html](http://www.syvum.com/cgi/online/mult.cgi/squizzes/chem/revct.html).

<sup>54</sup> From <http://palimpsest.stanford.edu/don/dt/dt1056.html>.

<sup>55</sup> From [www.syvum.com/cgi/online/mult.cgi/squizzes/chem/revct.html](http://www.syvum.com/cgi/online/mult.cgi/squizzes/chem/revct.html).

<sup>56</sup> From [www.chymist.com/mystery/%20solutions.pdf](http://www.chymist.com/mystery/%20solutions.pdf).



## APPENDIX D

Some compounds are stable in the presence of one another and do not react with one another:  $\text{HCl} + \text{CaCl}_2$  yields no reaction. Hydrochloric acid and calcium chloride do not react.<sup>57</sup>

In particular, the alkaline metal (M) earth oxides can be prepared by heating their carbonates in a simple decomposition reaction:

$\text{MCO}_3 + \text{heat}$  yields  $\text{MO} + \text{CO}_2$ . Both alkali metal oxides and alkaline earth metal oxides are ionic and react with water to form basic solutions of the metal hydroxide.

$\text{M}_2\text{O} + \text{H}_2\text{O}$  yield  $2\text{MOH}$  (where M = group 1 metal)

$\text{MO} + \text{H}_2\text{O}$  yield  $\text{M(OH)}_2$  (where M = group 2 metal).

Thus, these compounds are often called basic oxides. In accord with their basic behaviour, they react with acids in typical acid-base reactions to produce salts and water; for example,

$\text{M}_2\text{O} + 2\text{HCl}$  yield  $2\text{MCl} + \text{H}_2\text{O}$  (where M = group 1 metal).

These reactions are also often called neutralization reactions. The most important basic oxides are magnesium oxide ( $\text{MgO}$ ), a good thermal conductor and electrical insulator that is used in fire brick and thermal insulation, and calcium oxide ( $\text{CaO}$ ), also called quicklime or lime, used extensively in the steel industry and in water purification.<sup>58</sup>

## 9. PRECIPITATION

A 21st century definition of precipitation is given by the Encyclopaedia Britannica:

The term precipitation sometimes is differentiated from crystallization by restricting it to processes in which an insoluble compound is formed in the solution by a chemical reaction. It often happens that several substances are precipitated by a given reaction. To achieve separation in such cases, it is necessary to control the concentration of the precipitating agent, so that the solubility of only one substance is exceeded. Alternatively, a second agent can be added to the solution to form stable, soluble products with one or more components in order to suppress their participation in the precipitation reaction. Such compounds, often used in the separation of metal ions, are

<sup>57</sup> From [www.chymist.com/mystery/%20solutions.pdf](http://www.chymist.com/mystery/%20solutions.pdf).

<sup>58</sup> "chemical compound," Encyclopaedia Britannica, 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-79431>.

## CHEMISTRY

called masking agents. Precipitation was used for many years as a standard method for separation and analysis of metals. It has now been replaced, however, by selective and sensitive instrumental methods that directly analyze many metals in aqueous solutions.<sup>59</sup>

### 10. CRYSTALLIZATION

The Encyclopaedia Britannica has a pleasant and informative description of the process of crystallization, again thought of as just one more technique of chemical separation and purification:

Crystallization is a technique that has long been used in the purification of substances. Often, when a solid substance (single compound) is placed in a liquid, it dissolves. Upon adding more of the solid, a point eventually is reached beyond which no further solid dissolves, and the solution is said to be saturated with the solid compound. The concentration of the saturated solution depends on the temperature, in most cases a higher temperature resulting in a higher concentration.

These phenomena can be employed as a means of effecting separation and purification. Thus, if a solution saturated at some temperature is cooled, the dissolved component begins to separate from the solution and continues to do so until the solution again becomes saturated at the lower temperature. Because the solubilities of two solid compounds in a particular solvent generally differ, it often is possible to find conditions such that the solution is saturated with only one of the components of a mixture. When such a solution cools, part of the less soluble substance crystallizes alone, while the more soluble components remain dissolved.

Crystallization, the process of solidifying from solution, is highly complex. Seed particles, or nuclei, form in the solution, and other molecules then deposit on these solid surfaces. The particles eventually become large enough to fall to the bottom of the container. In order to achieve a high purity in the crystallized solid, it is necessary that this precipitation take place slowly. If solidification is rapid, impurities can be entrapped in the solid matrix.

---

<sup>59</sup> "separation and purification." Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-80493>.

## APPENDIX D

Entrapment of foreign material can be minimized if the individual crystals are kept small.<sup>60</sup>

### 11. AMINES

In the 21st century morphine is classified as a third degree amine, specifically a piperidine type.<sup>61</sup>

What are amines? The various definitions concur:

Amine (Etymology: International Scientific Vocabulary, from New Latin ammonia, 1863): any of a class of basic organic compounds derived from ammonia by replacement of hydrogen with one or more monovalent hydrocarbon radicals.<sup>62</sup>

The easiest way of looking at the basic properties of amines is to think of an amine as a modified ammonia molecule. In an amine one or more of the hydrogen atoms in ammonia has been replaced by a hydrocarbon group;<sup>63</sup>

The easiest way to think of amines is as near relatives of ammonia, NH<sub>3</sub>. In amines, the hydrogen atoms in the ammonia have been replaced one at a time by hydrocarbon groups;<sup>64</sup>

Amines (e.g. RNH<sub>3</sub>) are organic derivatives of ammonia, NH<sub>3</sub> (replace the N-H with N-C bonds) and has certain similarities with ammonia (e.g. basicity, nucleophilicity);<sup>65</sup>

Amines, in chemistry, (are) derivatives of ammonia (q.v.) in which one or more of the three hydrogen atoms are replaced by alkyl or aryl groups;<sup>66</sup> and,

---

<sup>60</sup> "separation and purification." Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-80493>.

<sup>61</sup> From [www.cem.msu.edu](http://www.cem.msu.edu) which discusses the nomenclature.

<sup>62</sup> From [www.merriam-webster.com/dictionary/amine](http://www.merriam-webster.com/dictionary/amine).

<sup>63</sup> From [www.chemguide.co.uk/organicprops/amines/base.html#top](http://www.chemguide.co.uk/organicprops/amines/base.html#top).

<sup>64</sup> "Introducing amines," [www.chemguide.co.uk/organicprops/amines/background.html](http://www.chemguide.co.uk/organicprops/amines/background.html).

<sup>65</sup> From [www.chem.ucalgary.ca/courses/351/Carey/Ch22/Ch22-0.html](http://www.chem.ucalgary.ca/courses/351/Carey/Ch22/Ch22-0.html).

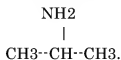
<sup>66</sup> "Amines," Encyclopaedia Britannica. Vol. 1. Chicago, IL: William Benton, 1965, p. 791.

## CHEMISTRY

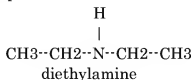
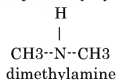
The structures of the various alkaloid molecules can be understood best by comparison with simpler compounds of nitrogen. In its compounds the nitrogen atom generally forms chemical bonds with three other atoms. In chemical terms, this is to say that nitrogen has a valence of three. For example, the valence bonds of nitrogen in the simple substance ammonia are completed by hydrogen atoms (symbol H, valence one). ... Other combinations of carbon and hydrogen atoms in hydrocarbon chains can be joined to the nitrogen atom, giving the large family of compounds known as amines ....<sup>67</sup>

Amines are classified according to how many hydrogen atoms have been replaced by these hydrocarbon groups:

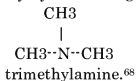
In primary amines, only one of the hydrogen atoms in the ammonia molecule has been replaced:  $\text{CH}_3\text{--NH}_2$ ,  $\text{CH}_3\text{--CH}_2\text{--NH}_2$ ,  $\text{CH}_3\text{--CH}_2\text{--CH}_2\text{--NH}_2$  or



In a secondary amine, two of the hydrogens in an ammonia molecule have been replaced by hydrocarbon groups:



In a tertiary amine, all of the hydrogens in an ammonia molecule have been replaced by hydrocarbon groups:



Why are amines basic?

Replacing the hydrogens still leaves the lone pair (of electrons) on the nitrogen unchanged - and it is the lone pair on the nitrogen that gives ammonia its

---

<sup>67</sup> "Alkaloids," *The New Encyclopedia Britannica*. 15th edition. Chicago: E. B. Inc., 1998, p. 597.

<sup>68</sup> From "Introducing amines," [www.chemguide.co.uk/organicprops/amines/background.html](http://www.chemguide.co.uk/organicprops/amines/background.html).

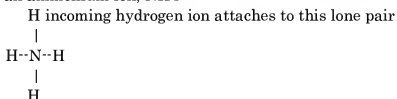
## APPENDIX D

basic properties. Amines will therefore behave much the same as ammonia in all cases where the lone pair is involved.<sup>69</sup>

How does ammonia react with acids?

Like ammonia, most amines are Bronsted and Lewis bases, but their base strengths can be changed enormously by substituents.<sup>70</sup>

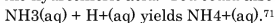
These are most easily considered using the Bronsted-Lowry theory of acids and bases - the base is a hydrogen ion acceptor. We'll do a straight comparison between amines and the familiar ammonia reaction. ... Ammonia reacts with acids to produce ammonium ions. The ammonia molecule picks up a hydrogen ion from the acid and attaches it to the lone pair on the nitrogen and forms an ammonium ion,  $\text{NH}_4^+$ :



If the reaction is in solution in water (using a dilute acid), the ammonia takes a hydrogen ion (a proton) from a hydroxonium ion. (Remember that hydrogen ions present in solutions of acids in water are carried on water molecules as hydroxonium ions,  $\text{H}_3\text{O}^+$ ):



If the acid was hydrochloric acid, for example, you would end up with a solution containing ammonium chloride - the chloride ions, of course, coming from the hydrochloric acid. You could also write this last equation as



How do amines react? The corresponding reaction is said to be very, very similar:

The nitrogen lone pair behaves exactly the same. The fact that one (or more) of the hydrogens in the ammonia has been replaced by a hydrocarbon group makes no difference. For example, with ethylamine: If the reaction is done in

---

<sup>69</sup> From [www.chemguide.co.uk/organicprops/amines/base.html#top](http://www.chemguide.co.uk/organicprops/amines/base.html#top).

<sup>70</sup> From [www.cem.msu.edu](http://www.cem.msu.edu).

<sup>71</sup> From [www.chemguide.co.uk/organicprops/amines/base.html#top](http://www.chemguide.co.uk/organicprops/amines/base.html#top).

## CHEMISTRY

solution, the amine takes a hydrogen ion from a hydroxonium ion and forms an ethylammonium ion:

$\text{CH}_3\text{CH}_2\text{NH}_2(\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$  forms  $\text{CH}_3\text{CH}_2\text{NH}_3^+(\text{aq}) + \text{H}_2\text{O}(\text{l})$ . The solution would contain ethylammonium chloride or sulphate or whatever. Alternatively, the amine will react with hydrogen chloride in the gas state to produce the same sort of white smoke as ammonia did - but this time of ethylammonium chloride:

$\text{CH}_3\text{CH}_2\text{NH}_2(\text{g}) + \text{HCl}(\text{g})$  forms  $\text{CH}_3\text{CH}_2\text{NH}_3^+(\text{g}) + \text{Cl}^-(\text{g})$ . These examples have involved a primary amine. It would make no real difference if you used a secondary or tertiary one. The equation would just look more complicated. The product ions from diethylamine and triethylamine would be diethylammonium ions  $(\text{CH}_3\text{CH}_2)_2\text{NH}_2^+$  and triethylammonium ions  $(\text{CH}_3\text{CH}_2)_3\text{NH}^+$ .<sup>72</sup>

The reactions of ammonia with water and amines with water help illustrate the production of ions:

Again, it is easiest to use the Bronsted-Lowry theory, and again, it is useful to do a straight comparison with ammonia. Ammonia is a weak base and takes a hydrogen ion from a water molecule to produce ammonium ions and hydroxide ions. However, the ammonia is only a *weak* base, and doesn't hang on to the hydroxide ion very successfully. The reaction is reversible, with the great majority of the ammonia at any one time present as free ammonia rather than ammonium ions:

$\text{NH}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$  forms a reversible reaction giving  $\text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq})$ .

The presence of the hydroxide ions from this reaction makes the solution alkaline.

The corresponding reaction with amines. The amines still contain the nitrogen lone pair, and does (sic) exactly the same thing. For example with ethylamine, you get ethylammonium ions and hydroxide ions produced:

$\text{CH}_3\text{CH}_2\text{NH}_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$  forms a reversible reaction giving  $\text{CH}_3\text{CH}_2\text{NH}_3^+(\text{aq}) + \text{OH}^-(\text{aq})$ . There is however a difference in the position of equilibrium. Amines are usually stronger bases than ammonia. (There are exceptions to this, though, particularly if the amine group is attached directly to a benzene ring.)<sup>73</sup>

---

<sup>72</sup> From [www.chemguide.co.uk/organicprops/amines/base.html#top](http://www.chemguide.co.uk/organicprops/amines/base.html#top).

<sup>73</sup> From [www.chemguide.co.uk/organicprops/amines/base.html#top](http://www.chemguide.co.uk/organicprops/amines/base.html#top).

## APPENDIX D

In some amines "the hydrocarbon chains are so joined as to form complete rings of atoms."<sup>74</sup> For example, benzene, C<sub>6</sub>H<sub>6</sub>, is the simplest member of a class of aromatic hydrocarbons (*italics added*):

An aromatic hydrocarbon ... is a hydrocarbon, the molecular structure of which incorporates one or more planar sets of six carbon atoms that are connected by delocalised electrons numbering the same as if they consisted of alternating single and double covalent bonds. The name 'aromatic' was assigned before the physical mechanism determining aromaticity was discovered, and was derived from the fact that many of the compounds have a sweet scent. This sweet scent actually came from impurities in the compounds (which are not actually aromatic in the sense initially described). The configuration of six carbon atoms in aromatic compounds is known as a benzene ring, after the simplest possible aromatic hydrocarbon, benzene. Aromatic hydrocarbons can be *monocyclic* or *polycyclic*. ... Examples of non-benzene compounds with aromatic properties are furan, a heterocyclic compound with a five-membered ring that includes an oxygen atom, and pyridine, a heterocyclic compound with a six-membered ring containing one nitrogen atom. ... Benzene derivatives have from one to six substituents attached to the central benzene core. Examples of benzene compounds with just one substituent are *phenol* (C<sub>6</sub>H<sub>5</sub>-OH), which carries a hydroxyl group ....<sup>75</sup>

## 12. PHENOLS

### Phenols are

any of a family of organic compounds characterized by a hydroxyl (-OH) group attached to a carbon atom that is part of an aromatic ring. Besides serving as the generic name for the entire family, the term phenol is also the specific name for its simplest member, monohydroxybenzene (C<sub>6</sub>H<sub>5</sub>OH), also known as benzenol, or carbolic acid. Phenols are similar to alcohols but form stronger hydrogen bonds. Thus, they are more soluble in water than are alcohols and have higher boiling points. Phenols occur either as colourless liquids or white solids at room temperature. Many phenols have a sharp, spicy odour, but

---

<sup>74</sup> "Alkaloids," *The New Encyclopedia Britannica*. 15th edition. Chicago: E. B. Inc., 1998, p. 597.

<sup>75</sup> From [http://en.wikipedia.org/wiki/Aromatic\\_hydrocarbon](http://en.wikipedia.org/wiki/Aromatic_hydrocarbon) retrieved 3 February 2008.

## CHEMISTRY

phenol smells bland and sweetish. It is, however, highly toxic and caustic. So-called natural phenol can be made from the distillation of coal tar or crude petroleum. Other phenols of natural origin are found in essential oils, which are derived from seeds or leaves of plants. ... Phenols are acidic and react with strong bases to form alkali-metal salts known as phenoxides.<sup>76</sup>

It should be emphasized that those alkaloids

that carry a phenolic hydroxyl group (an -OH attached to an aromatic ring) have acidic properties; they form water-soluble salts in the presence of strong bases and therefore are separated easily from their relatives lacking phenolic groups.<sup>77</sup>

### B. ALKALOIDS

A commercial site on the internet says that an alkaloid is "strictly speaking, a naturally occurring amine produced by a plant, but amines produced by animals and fungi are also called alkaloids."<sup>78</sup> Encyclopaedia Britannica available online has a broader definition: "any of a class of naturally occurring organic nitrogen-containing bases."<sup>79</sup> By contrast, the 1965 Britannica treats the definition not from the standpoint of chemistry but of physiology:

Alkaloids, complex compounds in plants that may produce pronounced physiological effects when consumed by or administered to man and animals. Examples of alkaloids are morphine, quinine, nicotine, strychnine and reserpine. Although it is virtually impossible to frame a definition for which there are no exceptions, alkaloids are usually understood (1) to be of plant origin; (2) to possess a basic, salt-forming, ammonialike character, a property

---

<sup>76</sup> "phenol." Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-9059614>.

<sup>77</sup> "Alkaloids," The New Encyclopedia Britannica. 15th edition. Chicago: E. B. Inc., 1998, p. 598.

<sup>78</sup> From Primary Information Services, [informer@eth.net](mailto:informer@eth.net) based in Ullagaran, Chennai, India.

<sup>79</sup> From "alkaloid." Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-9005753>.



## APPENDIX D

from which they derive their name (alkaloid means alkali-like); (3) to contain nitrogen; and (4) to produce physiological effects on man and animal.<sup>80</sup>

How many alkaloids are there? The 1965 Britannica knew of more than 900:

By the early 1960s the structure of almost all important alkaloids had been synthesized by that time. New alkaloids were being reported in the chemical literature almost every month, and the establishment of their structure constituted an important part of natural-product chemistry. Classification. - More than 900 alkaloids are known, but they are comparatively restricted in their distribution among plants.<sup>81</sup>

By 1970, only five years later, that number had more than doubled: "About 2000 alkaloids are known but they are present in only ten to fifteen percent of all vascular plants."<sup>82</sup> The 2008 Britannica online writes that more "than 3,000 different types of alkaloids have been identified in a total of more than 4,000 plant species."<sup>83</sup>

Why do alkaloids occur in plants? "The function of alkaloids in plants is not yet understood. It has been suggested that they are simply waste products of plants' metabolic processes, but evidence suggests that they may serve specific biological functions."<sup>84</sup> A late 20th century textbook on the subject agrees:

(T)he function of alkaloids in plants remains a subject for speculation. Many authorities regard them as by-products of plant metabolism. Still others conceive of alkaloids as reservoirs of protein synthesis; as protective materials discouraging animal or insect attacks; as plant stimulants or regulators in such activities as growth, metabolism, and reproduction; or as detoxicating agents, which render harmless, by processes such as methylation, condensation, and ring closure, substances whose accumulation might

---

<sup>80</sup> "Alkaloids," Encyclopaedia Britannica. Vol. 1. Chicago, IL: William Benton, 1965, p. 637.

<sup>81</sup> "Alkaloids," Encyclopaedia Britannica. Vol. 1. Chicago, IL: William Benton, 1965, p. 637.

<sup>82</sup> Pelletier, S. W. (1970), pp. 2-3.

<sup>83</sup> "alkaloid," EB online, <http://search.eb.com/eb/article-9005753>.

<sup>84</sup> "alkaloid," EB online, <http://search.eb.com/eb/article-9005753>.

## CHEMISTRY

otherwise cause damage to the plant. ... (It should be remembered that 85-90% of all plants manage very well without elaborating any alkaloids.<sup>85</sup>

While it is true that "when present in high concentrations they are deleterious to insects that customarily feed on alkaloid-containing plants ... the alkaloidal response is currently not purely a defensive response, though historically it may have been; it is now an integral part of a plant's primary metabolism."<sup>86</sup>

In order to attack this problem about the function of the alkaloids in the living plant (*italics added*),

chemists and biologists have speculated on this subject and developed many theories about biosynthetic schemes for various alkaloids. The concept with the widest support maintains that alkaloids are derived from amino acids, the building blocks of proteins. This idea is supported by the observation that the structure of most alkaloids can be derived from one or more simple derivatives of the naturally occurring amino acids, which are linked together by well-known chemical reactions. Some of the less complicated alkaloids have been synthesized in the laboratory in accordance with such bio-genetical theories from derivatives of amino acids under physiological conditions (room temperature and neutral reaction media). With the advent of isotopically labeled compounds these theories became subject to experimental tests. For example, it has been demonstrated that morphine is produced in the plant from the common amino acid tyrosine. When opium poppy was grown in water containing isotopically labeled tyrosine, the extracted morphine had the isotopic atoms located at the same positions as expected from the biogenetic theory that maintains *morphine is built from two molecules of tyrosine*.<sup>87</sup>

---

<sup>85</sup> Pelletier, S. W. (1970), p. 9.

<sup>86</sup> Baldwin, pp. 47-48, 65.

<sup>87</sup> "Alkaloids," Encyclopaedia Britannica. Vol. 1. Chicago, IL: William Benton, 1965, p. 639.

## APPENDIX D

### 1. POPPY ALKALOIDS

*Papaveraceae* is "an unusual family in that all of its species contain alkaloids."<sup>88</sup> In the genus *Papaver* alone, Smith, Kline laboratories lists over 150.<sup>89</sup> EB online 2008 says thirty in the species *somniferum*: "In general, a given species contains only a few kinds of alkaloids, though both the opium poppy (*Papaver somniferum*) and the ergot fungus (*Claviceps*) each contain about 30 different types."<sup>90</sup>

The alkaloids most commonly extracted from opium include morphine, codeine, oripavine, thebaine, papaverine and narcotine (noscapine). The juice of *P. somniferum*, opium, is a "complex mixture of various alkaloids, each with different properties."<sup>91</sup> Merlin lists, along with morphine (an analgesic), papaverine, codeine, narcotine, and thebaine (a convulsant) as the five principal alkaloids: "The different alkaloids contained in opium produce a variety of effects. Some depress, while others stimulate the central nervous system."<sup>92</sup> The principal alkaloid present in the poppy "is morphine, accompanied by small(er) amounts of ... codeine and thebaine."<sup>93</sup> Crude opium has a "morphine concentration of between 4 and 21 percent, depending on its quality and moisture content. ... (and) codeine in concentrations ranging from 0.7 to 2.5 per cent"<sup>94</sup> while the "derivatives of thebaine are the pain relief products oxycodone, buprenorphine, and hydrocodone, (as well as) the antagonist (antidote) products naloxone and naltrexone."<sup>95</sup>

---

<sup>88</sup> Pelletier, pp. 2-3.

<sup>89</sup> See for example, Raffauf.

<sup>90</sup> "alkaloid," EB online, <http://search.eb.com/eb/article-9005753>.

<sup>91</sup> Kabay, p. 2.

<sup>92</sup> Merlin, p. 93.

<sup>93</sup> Management, p. 2.

<sup>94</sup> Statistical, p. 77.

<sup>95</sup> Management, p. 2.

## CHEMISTRY

### 2. MORPHINE

#### a. DESCRIPTION AND PHARMACOLOGY

In 1831 William Henry described morphine as follows:

Pure morphia is perfectly white, has a pearly lustre, is destitute of smell, but has an intensely bitter taste. It dissolves in boiling water only in small proportion, but is very soluble in heated alcohol and ether, and the solutions are intensely bitter. By evaporation, they yield crystals, the primary form of which Dr. Thomson states to be a right rhombic prism. The watery and alcoholic solutions affect test papers like an alkali, and Robiquet found this property to be most distinct in morphia prepared by the intervention of magnesia, though proved, by its complete destruction by burning, to be free from any portion of that earth. It forms neutral salts with acids, and appears therefore, to approach closely in its characters to an alkali, which it also resembles in decomposing the compounds of acids with metallic oxides.<sup>96</sup>

A century later Small (1931) described it in these terms:

Morphine is obtained from opium, the dried juices which exude from the scratched unripe seed-capsules of the opium poppy, *Papaver somniferum*. The amount of morphine present in opium varies between wide limits; in a good grade of opium it averages 10%, although samples containing over 20% have been reported. ... Morphine crystallizes from dilute alcohol in small rhombic prisms, often having the appearance of needles ... It is very slightly soluble in alkali carbonates, readily soluble in alkali hydroxides, sparingly in alkaline-earth hydroxides. Ammonia precipitates the base crystalline from solutions of its salts with acids; it is somewhat more soluble in ammonia than in water.<sup>97</sup>

In 2002, Schiff described morphine as "an amphoteric pentacyclic alkaloid that exists naturally in its levorotary form as columnar colorless prisms:"

In addition to having the classic water solubility in alkali metal hydroxide and alkaline-earth metal hydroxide solutions characteristic of an alkaloid, the

---

<sup>96</sup> Henry (1831), p. 259 (GB).

<sup>97</sup> Small, pp. 138-139.

## APPENDIX D

phenolic group at C-3 confers water solubility via the formation of morphinate salts. Morphine forms water-soluble salts in many acids, with the sulfate salt being the most commonly encountered.<sup>98</sup>

Weill says the "(p)resence in morphine of three oxygen atoms, one of which belongs to a phenolic hydroxyl (gives) solubility in bases from which carbon dioxide re-precipitates it ...."<sup>99</sup>

The Encyclopaedia Britannica (1998) states that morphine (*italics added*)

the principal alkaloid of opium, is anarcotic analgesic drug used in medicine in the form of its hydrochloride, sulfate, acetate, and tartrate salts. ... It occurs as colourless crystals or a white crystalline powder. ... It is freely soluble in alkalies because of its acidic character. It is also a *monoacidic base*, forming salts that crystallize readily. The most commonly used are the sulfate, C<sub>17</sub>H<sub>19</sub>NO<sub>3</sub>·2·H<sub>2</sub>SO<sub>4</sub>·5H<sub>2</sub>O, and the hydrochloride, C<sub>17</sub>H<sub>19</sub>NO<sub>3</sub>·HCl·H<sub>2</sub>O.<sup>100</sup>

A contributor at <http://answers.yahoo.com> writes that a monoacidic base "means that the base can accept only 1 proton. Like NaOH and not like Ca(OH)<sub>2</sub>."<sup>101</sup> Other contributors agree, adding:

A base which can accept 1 proton per molecule of base, e.g. NaOH: NaOH + H<sup>+</sup>(aq) yields Na<sup>+</sup>(aq) + H<sub>2</sub>O. ... Diacidic - 2 protons Ca(OH)<sub>2</sub>: Ca(OH)<sub>2</sub> + 2H<sup>+</sup>(aq) yields Ca<sup>++</sup>(aq) + 2H<sub>2</sub>O. ... Triacidic base Al(OH)<sub>3</sub> + 3H<sup>+</sup>(aq) yields Al<sup>+++</sup>(aq) + 3H<sub>2</sub>O.<sup>102</sup>

---

<sup>98</sup> Schiff, p. 8.

<sup>99</sup> Weill, Paul B. "The Structure of Morphine," [www.poppies.org](http://www.poppies.org).

<sup>100</sup> "Morphine," The New Encyclopedia Britannica. 15th edition. Chicago: E. B. Inc., 1998, p. 32.

<sup>101</sup> From

<http://answers.yahoo.com/questions/index?qid=20071002031016AAJrU2A>.

<sup>102</sup> From

<http://answers.yahoo.com/questions/index?qid=20071002031016AAJrU2A>.

## CHEMISTRY

Encarta agrees with the definition of monoacidic: "Monoacidic - with one replaceable hydroxyl group: describes a chemical base or alcohol that has only one hydroxyl group that can react with an acid."<sup>103</sup>

Pharmacologically, morphine acts in the human body like the body's naturally produced endorphins, the word "endorphin (endogenous plus morphine) being coined to refer to the endogenous opioids as a group:"

Morphine is a classical exogenous opioid (xenobiotic opioid) that produces a well-characterized analgesia, as well as certain other pharmacological actions, as a result of its affinity to bind to receptors normally acted upon by endogenous opioids. Additional examples of exogenous opioids include other opium alkaloids, such as codeine, as well as semisynthetic opioids (oxymorphone, oxycodone, hydromorphone, hydrocodone) and synthetic opioids (meperidine, methadone, fentanyl, pentazocine).<sup>104</sup>

### b. FORMULA AND STRUCTURE

Although it had been extracted and roughly isolated using many different methods by the 1830s, the exact formula was not known in that era. Henry in 1831 listed a number of results from different investigators:

The following statements have been made of the composition of morphia; but from the want of agreement among them, it is probable that the substance operated upon has not in all cases been equally pure.

Carbon	72.0	72.02	69.0	44.72
Azote	5.5	5.53	4.5	0.00
Hydrogen	5.5	7.61	6.5	5.59
Oxygen	17.0	14.84	20.0	49.69

Until these differences have been reconciled, it would be premature to assign the atomic constitution of morphia. Its equivalent number, determined by its saturating power with respect to acids, appears to be a very high one, probably not less than 325.<sup>105</sup>

<sup>103</sup> From [http://encarta.msn.com/dictionary\\_1861630983/monoacidic.html](http://encarta.msn.com/dictionary_1861630983/monoacidic.html).

<sup>104</sup> Schiff, pp. 8-9.

<sup>105</sup> Henry, 1831, pp. 259-260 (GB).

## APPENDIX D

The precise details of the formula were worked out over the course of the 19th century:

The first elementary analyses by Liebig (1831) gave morphine the formula  $C_{34}H_{36}O_6N_2$ . Regnault (1838) found values for  $C_{35}H_{40}O_6N_2$ . ... In 1847 Laurent published the formula  $C_{34}H_{38}O_6N_2$ , corresponding to the now accepted formula  $C_{17}H_{19}O_3N$ . Raoult (1884) found a molecular weight in acetic acid corresponding to  $(C_{17}H_{19}O_3N)_2$ . Later determinations by Eykman (1888) and Von Klobukow (1889) showed the simple formula to be the correct one.<sup>106</sup>

The chemical formula for morphine was known by the beginning of the 20th century and was given as  $C_{17}H_{19}NO_3$ .<sup>107</sup> This formula is the one accepted by chemists in the 21st century as well.

After extracting and isolating it, chemists began to combine it with inorganic substances and eventually managed to synthesize it completely. Wright transformed morphine by acetylation to heroin (diacetylmorphine) in 1874 and Grimaux transformed it by methylation to codeine (monomethylmorphine) in 1881. Gates and Tschudi completely synthesized both morphine and codeine in 1952.<sup>108</sup> The structure of morphine

proposed in the 1920s by J. M. Gulland and R. Robinson was confirmed in 1952 by its total synthesis, accomplished by M. Gates and G. Tschudi. Starting with Schaeffer's acid, a coal tar intermediate, they succeeded in preparing morphine by a process involving 27 steps. Their synthesis was considered too long and complicated to be feasible commercially and its principal value was as a scientific achievement.<sup>109</sup>

---

<sup>106</sup> Small, p. 138; Schiff, p. 8.

<sup>107</sup> From the Encyclopedia Britannica, vol. 20, 11th edition. London: Cambridge University Press, 1911, p. 135.

<sup>108</sup> Schiff, p. 8.

<sup>109</sup> "Morphine," Encyclopaedia Britannica. Vol. 15. Chicago, IL: William Benton, 1965, p. 856.

## CHEMISTRY

### c. EXTRACTION AND ISOLATION OF MORPHINE

In the middle of the 19th century, the process of obtaining plant alkaloids and of morphine from opium was described quite simply:

When the native salt is soluble, as meconate of morphia, and the alkaloid itself is insoluble, there is no difficulty in its extraction, the simple addition of a strong alkali to the infusion of the vegetable substance neutralizes the organic acid with which the alkaloid is associated, and it is thrown down in a more or less pure form.<sup>110</sup>

The basic method given today for separating morphine from opium is also often presented as being relatively simple: "Dissolving opium in an acid and then saturating the solution with an alkali."<sup>111</sup> A variety of substances can be used including "alkalis, alkaline carbonates and ammonia (to) precipitate the important alkaloids."<sup>112</sup>

In 2002, Paul L. Schiff, Professor of Pharmaceutical Sciences in the School of Pharmacy at the University of Pittsburgh (Pennsylvania, U. S.) offered his third year pharmacy students the following explanation and recipe for isolating morphine (*italics added*):

The isolation of morphine from opium takes advantage of the amphoteric nature of the alkaloid, since *morphine is a phenolic amine*. Opium is mixed with water, followed by the addition of *lime (calcium hydroxide)*, in order to convert the opium alkaloids from their ionized, water soluble meconate or other plant acid salts into their unionized, water-insoluble free bases. The phenolic alkaloid morphine is soluble in the alkaline *lime solution* (pH 12) due to the formation of a water soluble phenolate salt. The suspension is filtered and *ammonium chloride* is added to the filtrate, resulting in the conversion of *calcium hydroxide* into calcium chloride and ammonia. As a consequence, morphine precipitates at this lower pH (pH 8-9) because its phenolate salt has been converted back to the unionized phenol, which is not capable of

---

<sup>110</sup> Parrish, Edward. An Introduction to Practical Pharmacy. 2nd edition. Philadelphia, PA: Blanchard and Lea, 1859, p. 387 (GB).

<sup>111</sup> Davenport-Hines, Richard. The Pursuit of Oblivion: A Global History of Narcotics 1500-2000. London: Weidenfeld and Nicolson, 2001, p. 15 (GB).

<sup>112</sup> EB, vol. 20, 1911, p. 135.



## APPENDIX D

remaining ionized in the weakly basic environment of ammonium hydroxide. The crude morphine precipitate is mixed with charcoal and either hydrochloric or sulfuric acid, filtered, and the filtrate alkalized with ammonium hydroxide, resulting in reprecipitation of morphine. This precipitate is collected via filtration and appropriately dried. It may be subsequently be (sic) converted to its sulfate salt for commercial purpose using conventional methods.<sup>113</sup>

In its essence, this is the Pelletier-Thibouméry-Mohr method accompanied by a much better theoretical understanding.

It can only be hoped that this review of high school and college chemistry may have helped clarify a number of basic concepts.

---

<sup>113</sup> Schiff, Paul L. "Opium and its Alkaloids," American Journal of Pharmaceutical Education, Summer, 2002, p.7 at <http://findarticles.com>.

## APPENDIX E SPECULATION

---

### APPENDIX E. SPECULATION

#### A. PERSPECTIVES

1. MEDICAL
2. PHARMACEUTICAL
3. POLITICAL
4. MILITARY
5. HISTORICAL
6. PERSONAL

#### B. QUESTIONS

1. DID LIN "DESTROY" THE OPIUM?
2. DOES LIN BELIEVE HE DESTROYS  
THE OPIUM?
3. WAS LIN ALSO CORRUPT?

#### C. ANALOGY

1. THE CASE AGAINST LIN
2. THE JUDGMENT

#### D. DISPROVAL OF THIS HYPOTHESIS

*No* justification or defense is offered for the following statements. They are offered only as unsupported speculation. The hypothesis presented may seem controversial to some. As a result, it may be worth a moment to consider some of the more obvious and logical repercussions of accepting such a theory.

#### A. PERSPECTIVES

Every morsel of new information requires a change of perspective. For purposes of argument only, if Lin did precipitate and distribute the alkaloids, what adjustments would then be necessary to the view of Lin and the period in question?

## APPENDIX E

### 1. MEDICAL

From a medical perspective, if Lin is sincere in his campaign against opium, and if smoking opium is more harmful than eating alkaloids, perhaps he could even be said to have done something benign, even healthy. On the one hand he "destroys" the English opium. On the other hand he helps wean the "poor, wretched Chinese" opium smokers from their "vicious habit" with his own brand of miracle cure, paid for by the barbarians themselves. This cannot be described as anything but brilliant.

For rebuttal, providing an alkaloid-based cure for opium smoking is too similar to chewing nicotine gum or using a nicotine patch to "cure" tobacco smoking. This is no cure but only ingestion in a different form. Ingestion methods matter. Chewing a nicotine gum may relieve the effect of a lack of tobacco smoke in the lungs but this does not mean that all drugs can be ingested more safely via the stomach. Cannabis and opium are said to be more easily titrated by smoking than by eating or drinking, both historically preferred methods of ingestion when abundant, licensed, taxed and well regulated. Lin's product would have been more concentrated but not necessarily better, an annoying fact which questions the original paternalistic premise.

### 2. PHARMACEUTICAL

Nothing has been presented that indicates Lin personally profitted in any way from any of his endeavors in Guangdong province. All that can really be said is that cures for opium smoking containing opium dross were sold around the same place and time and that he knew and approved of them. But if Lin did receive compensation for his labor, would this make Commissioner Lin not a destroyer of drugs but a dealer in drugs? If so, then Lin would share much with the early 19th century Western medical missionaries, many of whom were also peddling opium cures based either on opium dross or morphine. Since Lin's opium cures would have been sold legally at pharmacies in Guangdong province, he could not be

## SPECULATION

called a mere drug-dealer but would have to be treated as a pharmaceutical manufacturer.

Cynics might unfairly argue that he anticipates what Thomas Szasz calls the "ideology of pharmacracy embodied in the therapeutic state."<sup>1</sup> The sequence is still the same: declare a previous common medicine or custom a deplorable addiction. Having discovered a brand new problem, create a new brand as a solution. Push that brand with missionary zeal. Declare the medicine and customs of one's grandparents illegal, invent new and legal cure-alls, and churn the pharmacopeia for a tidy profit. And so, morphine replaces opium and heroin replaces morphine and codeine replaces heroin, and NSAID's replace codeine, and so forth and so on, ad infinitum. The hole in the analgesic market is rapidly filled and then re-filled with recently patented substitutes while the previously popular and still functioning remedies are routinely demonized. To paraphrase Gresham, bad medicine drives out good.

### 3. POLITICAL

From a political perspective, he is a true Han Chinese nationalist. He steals from the English and makes fools of the Americans. He deceives the weak and none-too-bright Manchu emperor. He hastens the changeover from a feudal Manchu to a more modern Han China, one of the goals of his so-called poetry club. He deceives and defeats, at least temporarily, representatives from the largest maritime empire on the planet. Not bad for the son a former schoolteacher.

### 4. MILITARY

From the viewpoint of the ensuing war, what Lin did or did not do with the opium occupies a mere footnote. The *casus belli* was the confiscation of the opium, not its disposition. Suppose for a moment

---

<sup>1</sup> Szasz, Thomas. *Pharmacracy: Medicine and Politics in America*. Westport, CT: Praeger, 2001, p. 162 (GB); see also p. 7 for the coercion of physicians and politicians in the creation of "illness inflation."

## APPENDIX E

that Lin had simply sold the opium. Suppose this had been well known at the time. Would this have made any difference?

Probably not much. The English were determined to have their war, not least because they could. As early as 1834, Lord Napier wrote to Earl Grey of India:

What can an army of bows and arrows, and pikes, and shields do against a handful of British veterans. I am sure they would never for a moment dare to show a front. The Batteries at the Bogue are contemptible; and not a man to be seen within them.<sup>2</sup>

Murray (1839) also notices the weakness of the Chinese military:

The military force of China has been represented, in regard to numbers at least, as very imposing: it has even been made to amount to millions. ... Mr. Barrow, however, does not doubt that 20,000 disciplined European troops might march from Peking to Canton, without meeting any serious resistance. ... An American frigate would beat the whole of their maritime force.<sup>3</sup>

Bridgman writes that the Chinese "could never stand against the discipline of European forces."<sup>4</sup> Even the emperor records the military weakness of China after the Napier affair in 1835:

It seems that all the forts are erected in vain; they cannot beat back two barbarian ships; it is ridiculous, detestable. The military preparation being reduced to such a state as this, it is not surprising that the outside barbarians regard them slightly. My further pleasure shall be given. Respect this.<sup>5</sup>

The British well understood that a successful war was possible. The problem was how to impose their mercantile notions of trade on a closed and feudal market. They knew they could do so. It was

---

<sup>2</sup> Chang, p. 57.

<sup>3</sup> Murray, Hugh. Encyclopaedia of Geography. Philadelphia, PA: Lea and Blanchard, 1839, pp. 411-412 (GB).

<sup>4</sup> Bridgman, E. C. "Introductory Remarks," *Chinese Repository*, vol. 2, p. 5 (GB).

<sup>5</sup> "China: The Late Dispute," *Asiatic Journal and Monthly Messenger*, vol. 17. London: W. H. Allen and Company, 1835, p. 115 (GB).

## SPECULATION

only necessary to get the military backing for such an enterprise. They had done this before, in India, for example. It is as easy to quote from documents from the 1830s that foreshadow the coming war and even invite it as it is to quote from documents from the 1930s that predict and even encourage a different approaching war. All that was needed was an excuse.

The basic problem for Manchu China was silver, not opium.<sup>6</sup> The Manchu government was rapidly going bankrupt. Silver was being exchanged for opium. The conflict with the foreign opium traders was inevitable. It was necessary to discipline the barbarians. This had been done before. Everything Lin does at Canton had already been suggested long before his arrival.<sup>7</sup> Lin's confiscation of the foreigner's property, not the ultimate disposition of that property, was a short-term solution to the problem for which Lin received criticism even before he had finished receiving the opium.<sup>8</sup>

No doubt the English might have felt even more self-righteous than they did with a clearly defined, openly avaricious enemy rather than a vaguely idealistic reformer. Some Chinese might feel less self-righteous today. But beyond this guilt-and-shame maundering, the result would have been militarily much the same from the moment the emperor attempted to enforce the prohibitions on the domestic production of opium.

## 5. HISTORICAL

The two unresolved discrepancies as to the number of the tanks and the location of the site, each one unaccountable on its own, might be linked. As noticed previously by Dr. Chang, there is a discrepancy in Lin's diary, his letters to the emperor and the Western accounts as to the number of tanks. Lin writes to the emperor: "Each of the ponds has a flat, stone-paved bottom, more

---

<sup>6</sup> See Appendix A-Silver, Salt and Opium.

<sup>7</sup> See, for example, Chang, pp. 126-127 and other memorials to the emperor of the period.

<sup>8</sup> Waley, p. 47.

## APPENDIX E

than 150 feet each in length and width ....<sup>9</sup> Since 1985 there has been an "Opium War Museum" located in Humen, Dongguan City, Guangdong Province.<sup>10</sup> Within the museum tourists can visit (*italics added*): "*(t)wo quadrate pools, with each side measuring 45 meters*, (which) were used to destroy the opium. The pools are made up of flagstones on the bottom ...."<sup>11</sup> Sir Stamford Raffles' described the Java salt ponds as square (*italics added*): "The salt-water is admitted through a succession of shallow *square compartments*, in each ..."<sup>12</sup> According to Lisa Su, who appears to have been reading the captions on a number of photos within the museum itself (*italics added*): "Humen became a center of *salt works* in the Song dynasty."<sup>13</sup>

The Dongguan Opium War Museum is located on (*italics added*) "the *seashore* of Sanyuan Islands in Humen Town."<sup>14</sup> A second tourist review of the museum says that Lin (*italics added*) "destroyed about 1,188,127 kilograms (2,619,372 pounds) of opium at Humen *Beach* in 1839."<sup>15</sup> A melded together version of the story reports: "On Humen beach, near a creek that emptied into Canton Bay beneath the watchful gun batteries of Fort Chuanbi, Chinese laborers dug three trenches ...."<sup>16</sup> Bridgman, however, describes a

---

<sup>9</sup> Kuo, p. 246.

<sup>10</sup> See "Opium War Museum," [www.chinaculture.org/gb/en\\_museum/2003-09/24/content\\_30619.htm](http://www.chinaculture.org/gb/en_museum/2003-09/24/content_30619.htm).

<sup>11</sup> See "Site of the Pool of Lin Zexu Destroying Opium and the Humen Batteries," [www.chinaculture.org/gb/en\\_travel/2003-09/24/content\\_32309.htm](http://www.chinaculture.org/gb/en_travel/2003-09/24/content_32309.htm).

<sup>12</sup> Tomlinson (1850), pp. 271-272 (GB).

<sup>13</sup> Su, Lisa. "Unique experience to visit Opium War Museum in Humen town, Dongguan, Guangdong Province," dated 15 June 2007, [www.yangshuoholiday.com/travel-story/Humentown.htm](http://www.yangshuoholiday.com/travel-story/Humentown.htm).

<sup>14</sup> See "Dongguan Opium War Museum," [www.mychinatravel.net/guangdong/dongguan/attraction/dongguan-opium-war-museum/](http://www.mychinatravel.net/guangdong/dongguan/attraction/dongguan-opium-war-museum/).

<sup>15</sup> "Opium War Museum," [www.travelchinaguide.com/attraction/guangdong/dongguan/opium-war-museum.htm](http://www.travelchinaguide.com/attraction/guangdong/dongguan/opium-war-museum.htm).

<sup>16</sup> "Korea in the eye of the Tiger," [www.koreanhistoryproject.org/ket/C17/E1704.htm](http://www.koreanhistoryproject.org/ket/C17/E1704.htm).

## SPECULATION

site just north of Chunhow, "on the bank of a creek, at the brow of a hill."<sup>17</sup>

Bridgman's report is one of only two written foreign eyewitness accounts of the process and neither King nor Lin describes the location by name. Without Bridgman's record, there is nothing to confirm that the opium was not soaked in ponds near Humen. Curiously, [www.macaudata.com](http://www.macaudata.com) contains volume 8 of the *Chinese Repository* but pages 70, 71, and 72, which describe the journey from Chuenpi up the river to just north of the creekside village of Chunhow, have been overlaid with previous pages, the only mistake in the book, a phenomenal coincidence. Page 73 begins just as the foreigners arrive at the site "to step on shore."<sup>18</sup> After repeated visits, this website was closed for "construction,"<sup>19</sup> not before copies of the errant volume were downloaded. Copies of volume eight (with the missing pages intact) were originally unlocatable at GoogleBooks but have since been made available.

Taken together, this might arouse the suspicion that not just Lin prefers to obscure the true location of the site. It may be that tourists are being led either to a relatively recently created set of purpose-built tanks or a more ancient set of salt evaporation ponds. If the latter, this further leads one to suspect that the two tanks Lin is referring to in his first letter to the emperor may have been intended to appear as ancient salt evaporation ponds near Chuenpi, the location of which the emperor might be cognizant of since salt was a government monopoly and a source of imperial revenue at the time. Satellite photos reveal a dark depression just north of the other two tanks of about the same size. It may also simply be that only two of the three tanks have been partially re-excavated, making an inconvenient reality fit an uncomfortable historical record. For rebuttal, this may be as simple as a mistranslation of *liang3* (MLBO, 1022.7) as "two" instead of "some" or "a few."<sup>20</sup>

<sup>17</sup> CR, vol. 8, p. 72 (GB).

<sup>18</sup> CR, vol. 8, p. 73 (MD).

<sup>19</sup> See [www.macaudata.com](http://www.macaudata.com).

<sup>20</sup> Compare *liang3* (MOOB, 1022) in the expression *liang 3 ju4* or (just let me say) "a few words." [www.nciku.com](http://www.nciku.com), [www.tigernt.com](http://www.tigernt.com), [www.chinese-](http://www.chinese-)



## APPENDIX E

Unfortunately, connecting the two problems means imagining a two-hundred year old cover-up, first by Lin who needs the opium to appear to have never been moved so he will not have violated the emperor's explicit instructions to destroy the opium on the spot, and later by a Chinese government needing to establish the probity of a nationalist, anti-drug icon.

### 6. PERSONAL

Lin, of course, would receive the greatest kudos possible. He is a truly remarkable individual who stands out in a time filled with remarkable personalities. He is a transitional figure, part feudal mandarin, part chemical engineer, part entrepreneurial businessman, part Han Chinese nationalist. He is a murderer. He imprisons, exiles, and condemns to death hundreds if not thousands of innocent people. He is a kidnapper and extortionist. By the standards of his time and especially his place, he is just. He is a great, practical chemist. He envisions, plans, organizes and conducts one the world's largest practical extractions of opium alkaloids it had ever seen to that date. He makes money. He turns a personal profit and writes himself a role in history as an honest man in a dishonest world. He secretly sells a remedy for an affliction he has created, preferring not to trumpet publicly his Confucian concern for the benighted.<sup>21</sup> He is a patriot. He helps weaken the Manchu tyranny, understanding also that the sea-going barbarians can only ever have a limited influence in his many millenia old country.

He is certainly far from perfect. He correctly estimates the American and underestimates the British response. He imagines the barbarians will return to trade after he has kidnapped them, threatened them with death and stolen their property. After a lull

---

tools.com, www.clearnchinese.com, www.yellowbridge.com, and www.mdbg.net all observe the possibility of "some" or "a few" as well as "both" or "two."

However, context is important. Morrison (1822) has *leang* as "two" (page 445).

<sup>21</sup> "Just so, it is the way of the superior man to prefer the concealment of his virtue ...." K'ung Keih (Kong Ji). *Chung Yung (Zhongyong, or Doctrine of the Mean)*. James Legge, translator. London: Trübner & Co., 1861, p. 295 (GB).

## SPECULATION

in the summer of 1839, the Americans did so, perhaps because their ox had only been bruised not gored:

The British trade now passed into the hands of the Americans. Between October 1, 1839 and June 18, 1840, as much as 24,826,599 pounds of tea were shipped to England .... It was estimated in May 1840 that the tea exported to the United States and the continent would exceed the usual supply.<sup>22</sup>

Though the British would not sign Lin's bond in order to trade, the Americans did so by pretending not to sign it:

A technical device was subsequently worked out whereby the bond was written in both languages on the same sheet of paper, the Chinese on top and the English below, and the merchants put their signatures in between the two versions. When the commander of a ship signed the bond before the vice-consul, it was declared that he was signing only what he understood and that he did not know Chinese. The bond, in the English version at least, mentioned no capital punishment.<sup>23</sup>

With this subterfuge, in October, 1839 the Americans "bought one of the empty receiving ships, loaded it with cotton, signed the guarantee and sailed up to Canton."<sup>24</sup> The American trading houses, Nye, Ryan, Delano and Russell acted as fronts for the English trading houses of Dent, Jardine, Macvicar and Grey.<sup>25</sup> This transshipment business made American fortunes from the steep freight charges: "To get silk and tea out through the ninety-mile passage, a ship was paid more than it would get for the voyage from Canton to the United States under normal conditions."<sup>26</sup>

Sadly enough, Lin underestimated Superintendent Charles Elliot's devotion to principle:

---

<sup>22</sup> Chang, p. 206.

<sup>23</sup> Chang, p. 207.

<sup>24</sup> Waley, p. 80.

<sup>25</sup> Chang, p. 207.

<sup>26</sup> Chang, p. 207.

## APPENDIX E

Before the British left the city (Canton), Elliot had personally "begged" Russell and Company to go with them: "If your house goes, all will go, and we shall soon bring these rascally Chinese to term." Robert Forbes's reply, as he reported it, was that "*I had not come to China for health or pleasure, and that I should remain at my post as long as I could sell a yard of goods or buy a pound of tea ... we Yankees had no Queen to guarantee our losses.*" Elliot asked whether Forbes would do business with a chain on his neck .... Forbes replied that the chain was "imaginary" while the duty to his clients and the commission account was real.<sup>27</sup>

Lin also did not appreciate the importance of a precedent in which the British government had recently compensated private owners for loss of property. Prior to his appointment at Canton, Charles Elliot had held positions in the foreign office and had been Protector of Slaves for four years in British Guiana: "In 1833 he was ordered home to put his knowledge of slavery to work - the government was then deliberating the issue of abolition of slavery in the colonies."<sup>28</sup> As a result of these deliberations, in 1834 the British government made a "payment of twenty millions for the extinction of slavery."<sup>29</sup>

In August 1834 Parliament passed a bill freeing all children under six in the West Indies. All other slaves were called apprentices and had to work for nothing for six years. Planters were given compensation totalling 20 million (pounds).<sup>30</sup>

Elliot certainly understood this precedent; how much of the idea was his and the extent of his involvement in the issue of compensating the owners of slaves is unclear. Lin cannot be blamed for not

---

<sup>27</sup> Chang, p. 206; italics Chang.

<sup>28</sup> Chang, p. 69.

<sup>29</sup> Tan Chung, p. 200.

<sup>30</sup> From [http://bbc.co.uk/worldservice/specials/1624\\_story\\_of\\_africa/page56.shtml](http://bbc.co.uk/worldservice/specials/1624_story_of_africa/page56.shtml). See also "Compensation for Slavery," *The Londoner*, Nov 2007, [www.london.gov.uk/londoner/07Nov/p19a.jsp?nav=on](http://www.london.gov.uk/londoner/07Nov/p19a.jsp?nav=on); Hochschild, Adam. "The Slavery Abolition Act 1833," [www.socialistworker.org.uk/art.php?id=10972](http://www.socialistworker.org.uk/art.php?id=10972); and "Abolition Movement," [http://uk.encyclopedia.msn.com/encyclopedia\\_761570452/abolition\\_movement.html](http://uk.encyclopedia.msn.com/encyclopedia_761570452/abolition_movement.html).

## SPECULATION

understanding the national and international implications of the British government's assumption (by Elliot) of a large debt due to Lin's seizure of private property. Few Chinese were aware of what was at stake at the time.

But of all the mandarins, Lin seems to be genuinely aware of his role and his era. He knows his punishment will also be limited: he is simply too competent to be discarded completely.

Indeed, even in his own time, he begins his rehabilitation. He truly does deserve his own bas-relief on the eastern face of the Monument to the People's Heroes, though not for the reasons popularly supposed. Instead of the story of Lin the drug-burning, idealistic nationalist, it is possible to tell the tale of Lin the drug-manufacturing, doctor-chemist-pharmacist and entrepreneurial Han nationalist, not a bad heroic combination for 21st century China. It would only be necessary to change some inscriptions: "Extracting the Alkaloids!" is one tentative suggestion for Beijing's bas-relief, "Pioneer in the Manufacture of Drugs!" for New York's statue, perhaps.

### B. QUESTIONS

Every proposed hypothesis suggests more questions. For purpose of argument only, if it is strongly true that Lin did precipitate the alkaloids then a number of secondary questions immediately beg to be answered.

#### 1. DID LIN "DESTROY" THE OPIUM?

For many this will be the central issue. The opium after all did disappear as a result of his process. Can it not still be maintained that Lin destroyed the opium?

Does distillation of the alcohol from wine or beer or a vat of must "destroy" the wine, beer or must? Distillation is a process, like that of using acids, bases and salts to precipitate alkaloids from plants, normally thought of as separation not destruction. The original solution is not thought of as having been destroyed, but its

## APPENDIX E

original alcoholic content has been considerably reduced. To say one has "destroyed" must, beer or wine by distilling from it the alcohol is to be both disingenuous and deceptive, to lie by omission if not by commission especially if the fact of the alcohol-rich result is concealed. The alcohol, the vast majority of it, is captured. While low and no alcohol wines and beers have a market, the majority of users do not drink alcohol for its taste alone. The very reason users drink alcoholic beverages in the first place (the alcohol) is the very purpose of and is even concentrated after the process of distillation.

Similarly, though aficionados certainly could grade the various qualities of opium available, users did not smoke opium for its "desirable oily paste." Thus, a similar analogy can be made for Lin's process of separating the alkaloids from the opium: the very reason users smoke opium in the first place, the alkaloids, are captured and are even concentrated after the extraction while the alkaloidal content of the remaining solution has been considerably reduced. By this more reasonable standard of intent, the answer to whether Lin "destroyed" the opium has to be no.

At this point the question can be posed, Did Lin destroy the alkaloids? This shifts the ground in the argument from the opium to the alkaloids. If Lin destroyed the alkaloids of the opium, then one can argue that effectively Lin has destroyed the opium. Beyond the possibility that he spent a great deal of time, expense and effort extracting the alkaloids and then could simply have discarded them, a less theoretical question can be posed.

Returning to and perhaps stretching too far the analogy, the distillation of alcohol is a practical matter, normally a multi-stage process, a series of successive separations. Using heat and condensation only some 96 percent of the available alcohol can be separated from any alcohol-rich liquid. The rest can be removed chemically to better than 99 percent. To take the metaphor to the extreme, since alcohol will in all likelihood be left in the original solution after a simple distillation, if this solution is discarded, then can this remaining alcohol, uneconomic to distill, be said to be destroyed? Yes, but not much and this is hardly the intention of the distiller.

## SPECULATION

Similarly, with Lin's extraction and precipitation of opium alkaloids there are serious practical realities involved with the process (pointed out by Barbier, for example) and one can question just how efficient Lin's process of removing the alkaloids from confiscated foreign or Chinese opium could have been. Nineteenth century European processes of alkaloid extraction were also notoriously inefficient. No doubt *some* alkaloids would have been left in the liquid portion in his tank or tanks and were let off through the sluiceway into the river. By this exacting definition of "destroy," the answer to whether Lin "destroyed" the alkaloids in the opium has to be yes, but not much nor can this be said to have been the purpose of the chemist.

### 2. DID LIN BELIEVE HE DESTROYED THE OPIUM?

This requires stepping into the mind of an Other, for most a foreigner from a foreign culture, now long supplanted, an impossible task. The evidence is circumstantial. Before the event Lin makes suggestions he knows will be ignored. He inspects his trenches long before he receives instructions from the emperor and even writes an elaborate poem defending his new process. His method recreates what Chinese purifiers of opium do to create a product for the Chinese market. During the process, Lin lies to the emperor overtly about the size, figure and number of the tanks, who came to visit and how they arrived, who was able to observe and how, and covertly as to where the tanks were dug. After the event, he investigates Western knowledge regarding opium cures and lies to a foreign head of state as to what exactly he did with the opium. All of this suggests the creation of alibis, plausible deniability and a pattern of deliberate concealment. These are not the actions of an innocent ideologue.

This argument can also shift ground, the question now becoming, Does Lin believe he has destroyed the evil, the "addictivity" in the opium? Early Western chemists sold morphine as a non-addictive cure for opium and heroin as a non-addictive cure for morphine. According to the advertisements, the chemical

## APPENDIX E

extraction process had destroyed the addictivity. Did they believe this or was this just convenient marketing? Do 21st century CEOs of pharmaceutical companies believe their own companies' advertisements for new, "non-addictive" pain-killers? If Lin sold his alkaloid-rich product as a cure for opium addiction, did he believe his own press?

### 3. WAS LIN ALSO CORRUPT?

If Lin did not destroy the opium, if he in fact turned a profit on it, would this mean that Lin also was corrupt? But Plato's Socrates answers this question several thousand years ago: "And do you really imagine, Meno, that a man knows evils to be evils and desires them notwithstanding?"<sup>31</sup>

First, there is the weakest evidence of guilt by association. The prohibition of the opium trade tended to create opportunities to help make up the shortfall in Mandarin government salary: "Mandarins in the Canton area (were accused) of receiving so much per chest."<sup>32</sup> Customs duties were more or less whimsical and it was necessary for the foreign traders to "seek in the corruptibility of the lower officers a refuge from the cupidity of the higher."<sup>33</sup> This extortion was known and remarked upon by every foreigner: "If others want to do the same (smuggle), they are forced to pay a levy of a hundred francs a chest to the mandarins."<sup>34</sup>

The Chinese mandarins proclaimed the prohibition and executed offenders while smuggling the opium in government boats:

For these very men not only accept of secret bribes to wink at the introduction of the article, but they have taken the whole business into their own hands, and authorize with the whole weight of their authority ... Here are the men

---

<sup>31</sup> Plato. *Meno*. Translated by Benjamin Jowett. Found at <http://classics.mit.edu/Plato/meno.html>.

<sup>32</sup> Fay, p. 47.

<sup>33</sup> Fay, p. 56, quoting from Charles King in the *Chinese Repository*, vol. 6, p. 512.

<sup>34</sup> Fay, p. 109, quoting a letter from Faivre to Etienne, 28 Feb 1838, *Annales*, 12: 186.

## SPECULATION

who promulgate the law, that opium shall not be imported; here are the men who break the law, not by sufferance merely, but by doing the very deed themselves ... in boats belonging to the government. ... I saw a mandarin boat pull up alongside a receiving ship and take in \$30,000 worth of opium .... The *Chinese mandarins are the last men* in the world to be intrusted with any public function.<sup>35</sup>

The low regard for mandarin integrity was universal. Bridgman noted in his "Journal of Occurrences" for June 1838:

Eight chests of opium were seized near the factories, about the middle of the month; four of the same disappeared in the very act of seizure, and the remaining chests were delivered over to the prefect of Kwangchow; and, wonderful to relate, while in the hands of the police, they were metamorphosed into four chests of common earth!<sup>36</sup>

In the words of Charles Elliot, Superintendent of Trade at Canton:

(T)hat the traffic in opium has been chiefly encouraged and protected by the highest officers in the empire, and that no portion of the foreign trade to China has paid its fees to the officers in so much regularity as this of opium!<sup>37</sup>

The general corruption among Chinese officials was well-known in the West:

The best informed Chinese about Canton, as we are credibly informed, state that the military secretary, the Quongship, received 13,000 taels per month from the commander of each Chinese smuggling boat, (a tael is about six shillings and eight pence sterling) and the Chinese dealers paid to the authorities from 60 to 80 dollars per chest for license to carry on their trade unmolested; the rate previous to the appointment of Tang, the present

---

<sup>35</sup> Lay, *CR*, vol. 7, pp. 142-143, italics original.

<sup>36</sup> Bridgman, *CR*, vol. 7, June 1838, p. 112 (MD).

<sup>37</sup> Elliot, *CR*, vol. 8, p. 69 (GB).



## APPENDIX E

Viceroy, having been from 16 to 30, but never exceeding 40 dollars. The Viceroy, of course, participated largely for himself.<sup>38</sup>

In short, all of his colleagues were corrupt. Governor-General Ting, who signs off on Lin's memorials to the emperor, was certainly corrupt. The reports of corruption are extensive, ubiquitous, easy to find, and extended far beyond only the mandarins. The Reverend Ellis, for example, said of the Chinese generally that "they are not nice about a strict adherence to the truth."<sup>39</sup> G. Tradescant Lay summed it up the best: "In China, every man is a smuggler in opium from the Emperor downwards."<sup>40</sup> Had Lin not been corrupt, he would have been, to paraphrase the incorrigible Gutzlaff, the only honest man in China.<sup>41</sup>

Second, whose standard is being applied? By King's absolutist standard of complete destruction of the opium proposed in his diatribe to Elliot, certainly Lin does not measure up. Lin does not in fact destroy *all* of the surrendered opium; he withholds eight chests as samples in order to (so he says) compare with the opium he is seizing from the Chinese in Guangdong province. But beyond this, of course, there is much evidence that Lin does not destroy the opium at all. He simply extracts the most important part of it, the reason for the importation of the opium in the first place, the desired alkaloids. The rest he discharges into the river.

Third, what is meant by corruption? One can question the loyalty 400,000,000 Han Chinese had to the one million ruling Manchu or Ch'ing dynasty. Lin was Han, not Manchu. Dikötter, Laaman, Xun for example, write:

Han scholars effectively used their networks of patronage to undermine the Manchu-Mongol strategists who dominated military thinking. Influential

---

<sup>38</sup> "War with China and the Opium Question," *Blackwood's Edinburgh Magazine*, vol. xlvii. Edinburgh: Wm. Blackwood and Sons, 1840, pp. 379-380 (GB).

<sup>39</sup> Ellis, W. in the introduction to Gutzlaff's *Three Voyages*, p. ix.

<sup>40</sup> Fay, p. 47.

<sup>41</sup> Gutzlaff (1834): "I regret not to have found (in Siam) one honest man" (p. 76).

## SPECULATION

officials, in particular Lin Zexu and Huang Juezi, believed that they could profit from an opium embargo as they used the fiscal woes of the 1830s as an opportunity to challenge Manchu-imposed administrative priorities.<sup>42</sup>

From the Han point of view, the problem was not one of corruption but politics:

The reason for the calamitous decision to wage war on opium was closely linked to internal court politics, in particular tensions between Han officials and Manchu aristocrats, as the former successfully turned opium prohibition into a political agenda. Confucian scholars not only saw it as their mission to express their concern over moral decay and an alleged breakdown in social order, but also hoped to regain the position of collective power and moral authority they had enjoyed before the conquest of the empire by the Manchus.<sup>43</sup>

From a distance, the latter motivation appears the more genuine.

Fourth, this notion of good and honest government is entirely modern, primarily Western, and mostly English. It is idealistic. Applying this standard to a foreign, feudal culture in the middle of a drug war does not seem to be in the least bit absurd? They don't have to be honest, they're Chinese, is not the argument. Many Western cultures function quite well with a certain modicum of inherent corruption. Governments, like societies, companies and individuals, require and indeed demand a certain dishonesty in everyday life. It is not necessary to look too far to see examples of dishonesty in modern governments, even when they are not funding an ongoing drug war. All wars corrupt; drug wars corrupt absolutely.

---

<sup>42</sup> Dikötter, et al., p. 45.

<sup>43</sup> Dikötter, et al., p. 107, quoting James M. Polachek's The Inner Opium War. Cambridge, MA: Harvard University Press, 1991.

## APPENDIX E

### C. ANALOGY

#### 1. THE CASE AGAINST LIN

It is completely unfair to imagine Lin on trial in the 21st century for what he did almost two centuries ago with the surrendered opium, a rather severe example of applying a law *ex post facto*. But for the purpose of argument it is possible to imagine the dilemma of a 21st century United States federal prosecutor. The police bring the prosecutor evidence of a raid on the home of a suspect, one Lin Zexu. In the home they find cookbooks, tools, equipment and ingredients for manufacturing morphine. Specifically, they discover internet printouts, mechanical stirrers, tanks with filters, and the basic ingredients, lime, salt and a raw material, a precursor, opium.

Further, the character of the defendant is doubtful. There are sworn statements by people he used to be in business with, that he kidnapped them, threatened them with starvation and death, and extorted from them their property. Beyond this, there are documents that prove the suspect lied to his bosses about the nature and type of his equipment as well as the details of the process itself and where his lab was located.

One must add that the quantity of material discovered suggests a manufacture for sale or distribution and not for personal use; more than this, there is evidence that the suspect officially endorsed the final product that was in fact distributed and sold. Does the prosecutor hesitate to file charges?

#### 2. THE JUDGMENT

Now consider the dilemma of a member of the jury in the trial of the defendant, one Lin Zexu. The defense attorney raises the issue of reasonable doubt, that the prosecution has not shown direct physical evidence that said defendant did in fact produce morphine, in part because at the time of the police raid the laboratory had since been abandoned. The defendant testifies in his own defense

## SPECULATION

that he was not in fact manufacturing morphine but was simply trying to destroy the raw material, the opium. Verdict?

To use a second unfair analogy, if a police detective confiscated the annual or semi-annual importation into the United States of cannabis, then unbeknownst to his superiors decided not to incinerate it (the traditional method) but instead decided to subject it to an extensive chemical process that could be used to extract the tetrahydrocannabinol, would this not at least raise the suspicions of an inspector general, in spite of protestations by said policeman that he was only trying to destroy the evil weed but by a different method?

### D. DISPROVAL OF THIS HYPOTHESIS

An hypothesis can never be proved, only disproved. It may be possible to amass whatever amount of evidence to confirm it; a single inescapable fact can doom it immediately. Every hypothesis therefore must be capable of being denied.

The central hypothesis presented here is that Commissioner Lin could have extracted alkaloids from the barbarian opium with his chosen method of soaking it in water, salt and lime. If false, it should be possible to test this hypothesis by recreating (on a somewhat smaller scale) what Lin did with the opium. It is, certainly, not possible to prove a negative when an infinity of possibilities must be considered, but it should be easy to design a finite number of experiments with opium, water, salt and lime that may as a practical matter lead to a denial of this hypothesis. If this hypothesis is incorrect, then by using Lin's ingredients and his description of the process to the emperor, one should *not* be able to produce a precipitate that is morphine-rich with varying amounts of the other alkaloids. Alternatively, either Bridgman's recipe of calcium hydroxide and salt or that of Southeast Asian chemists (using a salt substitution for the ammonium chloride) should *not* be able to yield such a result.

The general design of such an ungrounded, impractical, poorly thought out, untried and untested *Gedankenexperiment* is simple

## APPENDIX E

and has a limited number of variations. Obtain a sample of opium. Test the opium for the presence of morphine. Qualitative and quantitative tests include Fröhdes', Marquis', Meckes', UV light, potassium iodoplatinate or ferric chloride, as well as paper, thin layer, or gas chromatography. Compare results with a known sample. Prepare a brine with cold, distilled water and sea salt. The quantity of salt required should be varied stepwise until the point of saturation. Break, pulverize, kick, stamp or cut into four pieces the opium. Add the opium to the brine. Soak the opium in the brine solution for half a day, roughly six hours. Add the quicklime. The lime has variations as well: calcium oxide, calcium hydroxide, or calcium carbonate. For strict adherence to the design of the original experiment, the quicklime should be obtained from either limestone or seashells after it has been thoroughly heated in some kind of kiln. Commercial bagged lime generally will not react the same:

The bags of lime bought at a builder's supply store are almost always hydrated lime, which is quicklime that has been factory slaked only to the point that a powder is formed and not a putty. Hydrated lime is far less reactive and dangerous than quicklime and usually does not have the same properties as lime putty or hot lime mixes.<sup>44</sup>

Allow this mixture of quicklime, sea salt, water and opium to settle for between six and eighteen hours because Lin waited for the tide to change and did not work at night.

There should *not* be produced the separation phenomenon that Lin, King, Bridgman and 19th century European chemists describe. If there is, filter and capture the liquid; wash and filter the precipitate. Test both liquid and precipitate for the presence of morphine. Compare color and Rf values to the standard sample and the original unprocessed opium. If this proposed hypothesis is incorrect, the precipitate should not show the presence of morphine.

---

<sup>44</sup> Jones, Barbara. "Working with lime," *The Art of Natural Building*. J. Kennedy, et al, editors. Gabriola Island, B.C., Canada: New Society Publishers, 2002, p. 230.

## SPECULATION

Alternatively, add calcium hydroxide and salt together or lime first and then the salt. Variations using one tank or two should be considered. None of these methods should produce a precipitate that contains morphine.

If this hypothesis is incorrect, there will be no separation of the opium and no precipitate. It may be possible to produce this phenomenon depending on the proportions of the ingredients. If there is a precipitate, this hypothesis will still be incorrect if the precipitate contains no morphine. If all of the morphine remains in the liquid solution even after cooling, then Lin could not have obtained a morphine-rich residue on his filter using these methods. It may also be possible to produce this phenomenon depending upon settling times.

What cannot be predicted without some experimental results is the concentration of morphine in the final result of any of these experiments. The DEA's observer suggests a concentration of between 50 to 70 percent morphine is obtainable in the field. Lin may or may not have achieved this; he may have done even better. More than likely he did at least as well as any of his fellow European chemists.

What can also not be predicted without experimental results is the efficiency of the process. It would be pleasant to state that the majority of the morphine (and perhaps of the other alkaloids) of the original opium must have precipitated. But this would depend on the particular design, sequence, and operation of the experiment.

But mere inefficiency cannot by itself be allowed as a denial of the hypothesis. Lin's methods could have been particularly inefficient but could still have extracted considerable amounts of the morphine and other alkaloids. From all reports, this is the first time this method of lime and salt was ever tried on such a large scale, either in Europe or in Asia. Second, he may not have cared too much about yield since his main ingredient had been obtained relatively cheaply. Third, his market is essentially captive, without recourse at least temporarily to better or cheaper substitutions. If the foreign opium averaged some ten percent in morphine content and he extracts somewhat less than fifty percent of this available

## APPENDIX E

morphine, he still ends up with better than 100,000 pounds of morphine mixed in a brown residue and ready for delivery to the Chinese of Guangdong province. Fourth, Lin may also not have cared whether or not he could extract a pure morphine residue, but instead would have been satisfied with a precipitate that was heavily contaminated with the other alkaloids since the result would have been eventually sold medicinally as was that for example of Gregory and Robinson in Europe.

Coupled with intention, displayed by the particular choice of method and ingredients as well as the time, trouble and expense of building and operating his equipment, would the existence of even one such experimental technique that obtains the alkaloids not outweigh others that do not do so? Lin already shows he has purpose. If his intent is to destroy the opium, why does he choose to use ingredients and equipment coupled with a method that can extract the morphine? The traditional method of wutung oil and fire leaves 30 percent of the opium usable by Lin's own admission, at least according to Kuo's translation (not found in the original). Lin chooses an alternative by which 50 to 100 percent of the usable portion of the opium remains. Simply from the description, design and result of the many experiments already undertaken by chemists in three different centuries, it appears strongly that there is not just one technique of producing an alkaloid and morphine rich residue using Lin's ingredients and equipment, but at least three and probably many more.

If one such technique of alkaloid extraction from opium exists within this general method, and purposeful action exhibited by a sudden change of method exists, and the new method exhibits no advantage over the old and further is not nearly cost competitive, then to argue that Lin did not follow such a technique, did not in fact do just such an experiment, argues that Lin is incompetent. In all of his many other endeavors, Lin never shows himself to be incompetent.

## APPENDIX F APOLOGIA

---

### APPENDIX F. APOLOGIA

- A. THE "DESTRUCTION" BY FIRE
  - 1. LIN'S TRAGIC FALL
  - 2. NATIONAL AND INTERNATIONAL PROPAGANDA
- B. THE "DESTRUCTION" BY WATER, LIME AND SALT
  - 1. THE TWO CULTURES
  - 2. UNFAMILIARITY WITH THE OPIATES
  - 3. MARGARET MEADISM
  - 4. THE ANTI-OPIUM BIAS OF THE SOURCES
  - 5. MODERN ANTI-OPIUM BIAS
  - 6. THE DEVIL IN THE DETAILS
  - 7. THE PAUCITY OF THE SOURCES
- C. DISCUSSION AND QUESTIONS

*I*N the course of this investigation, it became apparent that zero references could be found to what seemed an obvious similarity between Lin's method and those of his contemporaries, the early 19th century Western alkaloid chemists. Some of the most careful scholars and researchers of the period have skipped over this point so easily. Even if these similarities were spurious, one would imagine that they should at least have been noticed and commented upon. Because of this lack of commentary, it is necessary to cautiously suggest a number of reasons why this admittedly minor detail of convergence has been so universally overlooked.



## APPENDIX F

### A. THE "DESTRUCTION" BY FIRE

The Burning Tale is a story that already exists and provides an alternative explanation of events. Simply due to inertia, it may never be superceded by any version of the truth for a number of delightful reasons. Among these are the compelling nature of the story and the determined efforts of governments to retell it.

#### 1. LIN'S TRAGIC FALL

First, this is a delicious story, a one-off. It is not difficult to find parallels in the popular story of Lin with the story of Jesus of Capernaum. Lin is a moral entity in an immoral world, a good man confronting a great evil. He struggles bravely against forces beyond his control and for a brief moment, triumphs, as does Jesus over the moneylenders. His fall is always attributed to greedy foreigners, a weak and wavering emperor, or unforeseen miscalculation.

On a deeper level, Lin "burns" the opium because this is how heroes have always purified evil. Medieval Western communities have long and not-so-proud histories of burning witches. These traditions continue in the present-day, pathetic and showy burnings of the same medicinal plants that were assuredly once grown in the gardens of the very same witches. The evil has now been transferred from the person to the plant but nothing else in the story has changed. Lin does no more and no less than this. The slaying of the wicked witch has always been a compelling story.

#### 2. NATIONAL AND INTERNATIONAL PROPAGANDA

The extensive propaganda efforts on the part of both national governments and international bodies which was mentioned in the beginning only adds to this inertia. Lin is a national hero in China and to many Chinese wherever they live. He has been adopted by Chinese nationalists and anti-drug internationalists. His "burning of the opium" is literally chiselled in stone in Beijing, the subject of a billion tourist photos. The United Nations is proud to associate him

## APOLOGIA

with International Anti-Narcotics Day. Thousands of websites and books and histories continue to this day to tell the tale of brave Lin "burning" the opium.

When governments do their best to obscure the truth, even going so far as to erect monuments in the central squares of their capitol cities, to chisel in marble a popular but false story, to promote cinematic and print versions of this beguiling fib so as to indoctrinate succeeding generations, to fund so-called scholarly research that simply repeats the same falsehoods, and to invite tourists to visit a shrine and museum to such nonsense, how can any one hope to draw any other conclusions in face of so gigantic a lie. When non-elected, international governmental bodies repeat the same foolishness with parks and statues and monuments around the globe, no responsible citizen can hope to do other than parrot the same propaganda. With so many so sure of what did not happen, it is difficult for any good researcher to get at some portion of the truth.

### B. THE "DESTRUCTION" BY WATER, LIME AND SALT

But why hasn't the similarity between Lin's method of "destruction" and the most commonly used method to extract morphine from opium been noticed by these investigators? This is not a non-trivial problem as some of the finest, most careful scholars have been taken in not only by the story of Lin burning the opium but more generally by the story of Lin destroying it with lime and salt.

#### 1. THE TWO CULTURES

In his Rede Lecture of 1959, C. P. Snow described the time when he was moving back and forth between scientists and writers at Cambridge. He kept noticing the same problem,

long before I put it on paper, I christened to myself as the 'two cultures.' For constantly I felt I was moving among two groups - comparable in intelligence,

## APPENDIX F

identical in race, not grossly different in social origin, earning about the same incomes, who had almost ceased to communicate at all ... I believe the intellectual life of the whole of western society is increasingly being split into two polar groups. ... (A)t one pole we have the literary intellectuals ... at the other scientists, and as the most representative, the physical scientists. Between the two a gulf of mutual incomprehension - sometimes (particularly among the young) hostility and dislike, but most of all lack of understanding.<sup>1</sup>

Some twenty years later, Northrop Frye, in the keynote address before the annual meeting of the American Association for the Advancement of Science on 3 January 1981, found little had changed:

As I understand it, my chief qualification for addressing you here is my total ignorance of everything you know. That gives a certain detachment to one's perspective, but it does not provide many other clues. I think that, broadly speaking, the 'two cultures' situation described by C. P. Snow some 20 years ago still holds in most respects. Lord Snow, you will remember, suggested that humanists and scientists did not see much of one another's point of view ....<sup>2</sup>

Those who are good at one thing are not necessarily good at another. Historians are not chemists. Good chemists do chemistry. The technologically capable are rarely interested in history or literature unless they are deemed by their peers to be slightly incompetent. Good historians do history. Those who excel in the liberal arts almost never can calculate or explain the scientific method and are not interested to do so.

It would be impossible to present Lin's method as an undergraduate research project to a competent organic chemistry professor conversant with the basic techniques of alkaloid extraction from plants and not have him immediately see it for what it is. But

---

<sup>1</sup> Snow, C. P. The Two Cultures and A Second Look. Cambridge: Cambridge University Press, 1998, p. 2-4 (GB).

<sup>2</sup> Gorak, Jan, editor. Collected Works of Northrop Frye. Toronto, Canada: University of Toronto Press, 2003, p. 315 (GB).

## APOLOGIA

no historian, confident in his technique of parsing the truth from the written accounts, bothers to do so.

As a result, almost no writer mentions the detail of the screen, "made fine like a sieve" in the words of Bridgman. Neither Fay, nor Collis, nor Waley, nor Chung mention it. Only Dr. Chang mentions it (clearly reading from Bridgman, the only eyewitness to observe it), and then only to parrot Bridgman's explanation (to prevent the escape of any large lumps of opium) which had obviously been suggested to him by Loo, his tour guide. But if the solids are not to flow into the river, where are they to go?

But the detail of the separation of the opium is the true stinger and no experienced chemist would miss it, yet it escapes both the Western eyewitnesses, King and Bridgman (they were only there for a half hour), as well as Waley, Chang, Fay, Collis and a host of others.

Only Dr. Tan Chung records it, because Lin does: "When it (opium) was being dissolved, a thick layer of oil surfaced, while the residue sank to the bottom."<sup>3</sup> In Kuo's translation, "At the time of dissolving, the thick oily part floats on the surface, while the siftings sink down."<sup>4</sup> But Chung's purpose is not to record the separation but to dramatize the horror: "A gust of foul smell rose which made one feel unbearable. At that moment, I realized that how this stuff could so much captivate people's minds, shorten their life-span and turn them into skeletons."<sup>5</sup> In Kuo's translation, "A particularly repugnant smell comes out from it, making people seek to avoid the ponds. We thereupon realize that it must be due to a particular manipulation in the preparation of the drug different from the ordinary method of deriving it from the poppy as commonly known, that this drug can stupefy men's spirits, shorten their lives, and distort their physical shape."<sup>6</sup>

---

<sup>3</sup> Chung, p. 200.

<sup>4</sup> Kuo, p. 246.

<sup>5</sup> Chung, p. 200.

<sup>6</sup> Kuo, pp. 246-247.

## APPENDIX F

Sodium chloride, calcium oxide, a boiling, a separation, a settling and cooling time and a filter on the exit of the tank all argue a chemical process is taking place. European experiments in the 19th century argue against a mere destruction. The humanist historian sees only the horror. The experimental chemist never reads the details of history.

No hypothetical generally interested reader would ever notice the details of this connection between Lin's method and morphine-extraction processes because the stories vary of both. In order to connect the dots, the story of Lin's use of salt and lime would have to occur in the same archive as the method of using lime (for example) to extract morphine. One of the few examples of where the two cultures meet is in a general encyclopaedia. But not all encyclopaedias contain both accounts and when they do, the story of Lin is presented either incorrectly (e.g., burnt) or more generally (destroyed) while the methods for extracting morphine, of which there are as many stories as those of the process of Lin, are also presented generally (alkalis, etc) and lime is rarely mentioned. Some websites contain a version of DEA 20026 and a timeline but the latter is often deliberately brief, over-generalized and non-descriptive.

One must also mention that many electronic sources that contain references in the same volume to both Lin and lime appear to have been deliberately corrupted. Volume six of Chambers's Encyclopaedia, 1864 has "(m)orpha is the only opium alkaloid which is soluble in lime water, and this property affords one of the best means of extracting it" on page 575.<sup>7</sup> Completely coincidentally, the article on Lin-Tseh-su is suddenly truncated on page 143, with pages 144 and 145 gone walkabout.<sup>8</sup> Volumes of the same encyclopaedia from 1863 and 1865 show no missing pages in their online versions. Combine this with the overlaid pages of volume eight of the *Chinese*

---

<sup>7</sup> Chambers, W. and R., editors. Chambers's Encyclopaedia - A Dictionary of Universal Knowledge for the People. Vol. VI. London: W. & R. Chambers, 1864, p. 575 (GB).

<sup>8</sup> Chambers, vol. vi, p. 143-146 (GB).

## APOLOGIA

*Repository* describing the location of Chunhow and the missing pages from Murray's Historical and Descriptive Account of China suggesting morphia be introduced to the Chinese and it appears that someone has been busy attempting to purge the basic historical record, that Google has done more than simply appease the present Chinese government by helping it to censor the information its own people receive<sup>9</sup> but that Google is also willing to help it censor any potentially embarrassing information any one else in the world may receive as well, a warning to other researchers that GoogleBooks is infected with tiny electronic GoogleBookMites.

The two cultures that do not communicate may also explain why this connection between Lin and morphine seems to have escaped the notice of the 19th century European alkaloid chemists, then working in the "golden age" of alkaloid extraction. So many alkaloids had just recently been extracted and isolated in the laboratories of Paris, Edinburgh, and London that it seems reasonable to presume at least one of these early chemists must have also noticed the war in China, and Lin's *casus belli*, the seizure and soaking of the opium in lime, salt and water. But there seems to be no record of any of their suspicions on file. This may be due to the paucity of the sources (see subsection seven below).

Probably the best joke of all is that no one would have noticed the separation if Lin himself had not mentioned it, almost as if it were an afterthought, in his first letter to the emperor describing his new method. Lin appended this detail in a description of the repugnance, the stupification, the quickened death, and the physical distortion of opium users and clearly intended the emperor to be captivated by the latter. Like any good poet, he encloses the deeper truth within the transient emotion.

---

<sup>9</sup> Lenssen, Philipp. "Censored Google China Book Search Launches," 2 March 2007, <http://blogoscoped.com/archive/2007-03-02-n45.html>; "Google censors itself for China," Wednesday, 25 June 2006, <http://news.bbc.co.uk/1/hi/technology/4645596.stm>; and [en.wikipedia.org/wiki/internet\\_censorship\\_in\\_the\\_People's\\_Republic\\_of\\_China](http://en.wikipedia.org/wiki/internet_censorship_in_the_People's_Republic_of_China).

## APPENDIX F

### 2. UNFAMILIARITY WITH THE OPIATES

Few modern writers, Western or Eastern, are personally familiar with the plant, opium or the opiates in general. In part, this is due to the incessant and extensive propaganda against the use of drugs, and of opiates in particular. This means the subject is somewhat exotic for the authors themselves. They are at once averse to and fascinated by the subject, instead of being objective and impartial. It may seem strange to write about a subject without having any personal familiarity with it, much like writing about french toast or roasted grasshoppers on a spit without having tasted either. But it is clear from reading many good authors that they themselves do not use the opiates or opium. As a result, they are that much more apt to accept what those with such personal experience never would. The same authors who are so certain of the evils of an unknown and unexperienced drug like opium would reject out of hand any criticism from an outsider concerning the extensive and excessive use of known and often experienced drugs like alcohol, tobacco and coffee in their own societies.

### 3. MARGARET MEADISM

The U. S. cultural anthropologist Margaret Mead (1901-1978) suggested in her study of adolescence among Pacific islanders in Coming of Age in Samoa (1928) that the "transition of Samoan young girls into adult women went apparently without emotional crises" in contrast to that "marked by emotional or psychological distress, anxiety, or confusion in the U. S."<sup>10</sup> Half a century later, the New Zealand anthropologist Derek Freeman (1916-2001) claimed that

Mead's portrayal of a trouble-free, sexually permissive coming-of-age in a South Sea paradise was ideologically biased and poorly researched, a hoax

---

<sup>10</sup> Wikipedia; [www.kirjasto.sci.fi/mmead.htm](http://www.kirjasto.sci.fi/mmead.htm).

## APOLOGIA

foisted upon a young inexperienced woman by mischievous adolescent informants.<sup>11</sup>

Going even further, Freeman "portrayed Mead as a compliant victim of this hoax; he said that it suited her worldview and politics."<sup>12</sup> This ignited a controversy that has yet to subside and Freeman's own work has since been severely criticized as inaccurate, though not on its major points.<sup>13</sup>

Western writers, even the sinologists and those with personal experience of Chinese culture, tend to write about China from a distance. What they would never assume for a motivation in the West, they easily assume for a separate and idealized Other. A European who dissolves opium in water and then adds lime and salt would automatically be assumed to be engaged in some kind of chemical process, probably driven by research or financial considerations. When a Chinese does the same thing in Canton, he can only be doing so to instruct heathen barbarians. The European seeks to make money; the Chinese can never be accused of having such base commercial instincts.

### 4. THE ANTI-OPIUM BIAS OF THE SOURCES

The eyewitnesses, ostensibly the sources of accurate information about the event, are all publicly biased against opium, including Lin himself, the missionary Bridgman and the merchant Charles King. It is one of the curious things they have in common.

---

<sup>11</sup> Robin, Ron T. Scandals and Scoundrels. Berkeley, CA: University of California Press, 2004, pp. 113-114 (GB); Wikipedia gives Freeman's two exposés as Margaret Mead and Samoa: The Making and Unmaking of an Anthropological Myth. Cambridge, MA: Harvard University Press, 1983 and The Fateful Hoaxing of Margaret Mead. Boulder, CO: Westview Press, 1999.

<sup>12</sup> Robin, pp. 113-114 (GB).

<sup>13</sup> See for example, Martin Orans' Not Even Wrong: Margaret Mead, Derek Freeman and the Samoans. San Francisco, CA: Chandler and Sharp, 1996 and reviews by James A. Donald and others of same on GB.



## APPENDIX F

This tempts historians to retell the story which the original observers told: the longed-for destruction of a great evil.

All three eyewitness accounts suffer from this anti-opium bias. That the two existing reports by Westerners were both publicly against opium seems to be generally unworthy of notice. That they did not question what they saw presupposes that 21st century Westerners will not question what these eyewitnesses reported. The nagging facts that won't go away like the sudden change of method from a burning to a soaking, the general lack of outside observers, and the blatant use of an obviously chemical process, were ignored by the Western eyewitnesses and so has every Western historian since. Lin *destroyed* the opium because both King and Bridgman wanted him to destroy it; succeeding generations of Western historians believe them in part because they have no other opinions to work from. Lin also wants the opium *destroyed*. He is careful to make it appear to be so in his letters to the emperor.

### 5. MODERN ANTI-OPIMUM BIAS

Not only are many good scholars and writers personally unfamiliar with the opiates, in particular opium, but they also readily admit to a bias against something of which they have no personal experience. Even the better scholars are unapologetic for this anti-opium bias.

Dr. Tan Chung calls opium poison: "Thus, so much poison which would feed about three million addicts for a whole year was sent back to the sea from where it had come .... If this quantity of poison had reached the interior of China, how many lives would have been destroyed and how many families ruined."<sup>14</sup> He accuses the opium traders as engaging in a "large-scale mass killing" and is careful to agree with the many scholars who "have commented that even the slave trade is more humane than the opium trade."<sup>15</sup>

---

<sup>14</sup> Chung, p. 200.

<sup>15</sup> Chung, p. 144.

## APOLOGIA

John King Fairbank, Francis Lee Higginson Professor of History at Harvard University, writes: "The modern Chinese sense of grievance over the war is reinforced by the plain facts that opium smoking was pernicious .... It would be hard to devise a more stark and simple, black and white, story of Chinese victimization ...."<sup>16</sup>

Dr. Hsin-pao Chang writes in his preface: "Throughout my life in China, I witnessed hundreds of my countrymen and my closest relatives become its victims. In pursuing this study, it was of no use to deny or suppress my own feelings."<sup>17</sup> In his opinion, inevitably, the "addict becomes a complete slave of the drug ... (and) his need becomes so great that he will do anything, lie, cheat, or steal, to obtain money for the drug. The loss of moral integrity and crime are the natural results."<sup>18</sup>

P. C. Kuo says: "Meantime, the widespread evil of opium was arousing great apprehension in China. A considerable section of the Cantonese troops had been depraved by the habit of smoking opium."<sup>19</sup>

Peter Ward Fay writes: "So the Chinese government can scarcely have understood how dangerous it (opium) was."<sup>20</sup> "Perhaps," he says, "it is foolish of us to wish that the English, or anybody else, should have perceived how destructive opium smoking in the orient was going to be."<sup>21</sup>

These comments have been labelled as anti-opium bias because it is just as easy to quote from authors with much personal experience who would disagree.

An Indian civil servant testifying before the Royal Commission on Opium of 1893 observed: "I have often thought that the best practical answer to those who inveigh against the use of opium

---

<sup>16</sup> Fairbank, p. vii, Foreword to Chang's Commissioner Lin and the Opium War.

<sup>17</sup> Chang, p. xi.

<sup>18</sup> Chang, p. 17.

<sup>19</sup> Kuo, p. 50.

<sup>20</sup> Fay, p. 42.

<sup>21</sup> Fay, p. 206.

## APPENDIX F

would be ... to bring one of our crack opium-drinking regiments to London and exhibit them in Hyde Park."<sup>22</sup>

Testimonials to the English use of opium appeared in the *Canton Register*:

the principal physician of London had decently dismissed him to Bath, to die, declaring that 'he had not stamina to last a fortnight.' ... His returning health was in a great measure the effect of a prudent use of opium .... Crabbe was another remarkable instance of an individual in whom opium was of great benefit .... (Tait's Mag).<sup>23</sup>

First Lt. Bingham of the *Modeste* in 1840 rejected the idea

that the opium trade has been forced on them (the Chinese) .... (T)he opium is used by them in the least deleterious manner, vis., by smoking.<sup>24</sup> .... I must once more beg my readers not to allow their feelings to be carried away by any highly wrought descriptions of the miserable state of the opium smoker ....<sup>25</sup> Although I saw many smoking in the opium-booths, I observed none of those horrid-looking abjects that are described by others .... (The Chinese opium smoker) was always ready and willing to go to work.<sup>26</sup>

John Trotter, a junior member of the Board of Customs, Salt and Opium of India, testified:

During the nearly nine years I was attached to the Benares Agency ... I never knew one solitary instance of impaired health amongst natives resulting from the use of the drug, not even in the factories, where the people passed 12 hours a day in an opium atmosphere and ate as much as they could consume.<sup>27</sup>

---

<sup>22</sup> Fay, p. 7.

<sup>23</sup> "Opium - Its beneficial effects on Mr. Wilberforce and Mr. Crabbe," *Canton Register*, vol. 11, Thurs. 30 Oct 1838, no. 44, p. 176.

<sup>24</sup> Bingham, pp. 22, 35 (GB).

<sup>25</sup> Bingham, p. 138 (GB).

<sup>26</sup> Bingham, pp. 409-410 (GB).

<sup>27</sup> Fay, p. 185, quoting Trotter's testimony of 2 May 1839, Bengal Proceedings, P/107/39, IOL.

## APOLOGIA

The Reverend Peter Parker, M. D. published ten reports on the Ophthalmic Hospital at Canton for the years 1835-1839. Primarily begun as a specialist institution, it quickly morphed into a general hospital.<sup>28</sup> Of the 7000 patients treated during this period, 42 were treated for "Opium-mania" described by the doctor as "(a)pplied to such as have become slaves to the use of 'the drug,'" <sup>29</sup> roughly one half of one percent of the population, close to the rates of those patients who sought treatment for hare lip or scrofula.<sup>30</sup> Similar rates of enslavement were observed at the temporary hospital at

---

<sup>28</sup> Parker, Peter. "Tenth Report of the Ophthalmic Hospital, Canton, being for the year 1839," *Canton Repository*, vol. 8. Canton: Printed for the Proprietors, 1840, p. 625.

<sup>29</sup> Parker, Peter. "Tenth Report of the Ophthalmic Hospital, Canton, being for the year 1839," *Canton Repository*, vol. 8. Canton: Printed for the Proprietors, 1840, p. 625; "Ophthalmic Hospital at Canton: the ninth report, being for the quarterly term ending December 31st, 1838," *Canton Repository*, vol. 7, p. 672; "Ophthalmic Hospital at Canton: the eighth report including the period from January 1st to June 30th, 1838," *CR*, vol. 8, p. 94; "Ophthalmic Hospital at Canton: Seventh report, being that for the term ending on the 31st of December, 1837," *CR*, vol. 6, p. 435; "Ophthalmic Hospital at Canton: the sixth quarterly report, for the term ending on the 4th of May, 1837," *CR*, vol. 6, p. 36; "Ophthalmic Hospital in Canton: the fifth quarterly report, for the term ending on the 4th of February, 1837," *CR*, vol. 5, p. 457; "Ophthalmic Hospital in Canton: the fourth quarterly report, for the term ending on the 4th of November, 1836," *CR*, vol. 5, p. 323; "Ophthalmic Hospital at Canton: third quarterly report, for the term ending on the 4th of August, 1836," *CR*, vol. 5, p. 185-186; "Ophthalmic Hospital at Canton: second Quarterly Report, from the 4th of February to the 4th of May 1836," *CR*, vol. 5, p. 33; "Ophthalmic Hospital at Canton: first quarterly report, from the 4th of November 1835 to the 4th of February 1836," *CR*, vol. 4, p. 461.

<sup>30</sup> "(P)articular characteristics associated with scrofula have varied at different periods, but essentially what was meant was tuberculosis of the bones and lymphatic glands, especially in children." - *Encyclopaedia Britannica* Online 2008 at <http://search.eb.com/eb/article-9066395>.

## APPENDIX F

Macao,<sup>31</sup> and by Dr. Bradley at the Siamese Dispensary in Bangkok<sup>32</sup> during this same period.

The point is not to argue here the brief for or against opium or opium-smoking; it is enough to notice that a convincing case can be made that opium is beneficial or at least non-harmful. Many scholars, observers and users with much direct experience with opium would disagree strongly with the monstrous images conjured up by those who lack this direct and immediate experience. As a result, this jaundiced view of opium by the non-using critics can fairly be defined as a pre-judging, an anti-opium or anti-opium-smoking prejudice.

In part, the problem for 20th and 21st century historians is the societies in which they live, currently undergoing the First World Drug War, replete with the great fear of and clamour against drugs, the opiates in particular. E. H. Carr, in What is History? writes that history is necessarily a dialogue between the present and the past:

When we try to answer the question "What is history?" our answer, consciously or unconsciously, reflects our place in time and it forms a part of our response to a much wider question of that idea that we have formed of the society in which we live.<sup>33</sup>

Escaping the prejudices of the moment is difficult. But an anti-opium bias in the present leads inexorably to problems of interpretation of the past. Since opium is bad today, its destruction yesterday must have been good and will never be seriously questioned. If history is indeed a dialogue, what conversation can be

---

<sup>31</sup> Parker, Peter. "First report of the Medical Missionary Society's Hospital at Macao, for the quarterly term beginning 5th July, and ending 1st October, 1838," *CR*, vol. 7, p. 411-412.

<sup>32</sup> Bradley, D. B. "Brief account of the Siamese Missionary Dispensary, at Bangkok, from August 8th, 1835 to October 5th, 1836," *CR*, vol. 5, p. 444-447.

<sup>33</sup> Carr, E. H. *Que es la historia?* Translated by Joaquin Romero Maura. Barcelona: Editorial Seis Barral, S. A., 1981, p. 11, retranslation mine. Original title: What is History? (1961).

## APOLOGIA

had between an opium demonized present and a commercialized opium past but a dialogue of the deaf.

### 6. THE DEVIL IN THE DETAILS

The point is a small one, a detail. What Lin did or did not do with the opium does not much matter to authors and scholars considering the period, the background and history surrounding the conflict of empires, the confiscation and the ensuing war. Their focus is on larger issues. What happened to the opium is a footnote, often not worth serious investigation.

True, it is an important footnote. If the cause of the war can be said to be either opium or Lin, then Lin's disposal of the opium could be said to be the signature event of the period. If there is even a hint that the opium was not destroyed, was in fact processed for its alkaloids which were then distributed and sold as legal cures, this may shape the larger picture of the motivations of the characters in this passion play and perhaps of the moral drawn from the play itself.

### 7. THE PAUCITY OF THE SOURCES

Finally, not only are the eyewitness sources biased against opium, there are simply too few of them, only three precisely. Historians are necessarily forced to work from their sources:

Historians are confronted with the absolute impossibility of being able to check for themselves the facts they study. No Egyptologist has ever seen Ramses. No specialist in the Napoleonic Wars heard the cannon at Austerlitz. As a result, we are unable to speak of the epochs that have preceded us without turning to the testimony of witnesses. We are in the same situation as a judge who tries to reconstruct a crime at which he was not present ... (T)he knowledge of the past will necessarily be 'indirect.'<sup>34</sup>

---

<sup>34</sup> Bloch, Marc. *Introducción a la historia*. Translated by Pablo Gonzalez Casanova and Max Aub. Mexico, D.F.: Fondo de Cultura Económica, S. A.,

## APPENDIX F

When the sources for testimony about an historical event are many and varied, this dependence upon them goes unnoticed.

But as the number of sources approaches one, the probability of bias does also. Few sources implies a lack of variety in opinion. Few sources also guarantees that any given bias will not be factored out by other opinions and that this singular bias will carry necessarily more weight. Few sources uniformly biased in a given direction implies an untrustworthy narrative.

Worse than this is that for roughly a hundred and fifty years there are not three sources generally available; there is one. Lin's version is generally not available in the West for the next century, and then only in Chinese except for a few excerpts. Bridgman's more careful observations are lost in the back issues of the *Chinese Repository* available only to a few hundred subscribers and careful researchers who want background on the period. There are obscure references in several books to written anonymous Chinese sources from the period disputing Lin's veracity in the handling of the foreign opium but these are usually not translated or dismissed as untrustworthy.

The version most widely published in the 19th century was that of King, the eyewitness who observed the least. Excerpts of King's letter found in Allen and Warren read like a coherent and complete narrative of the event but contain no mention of either salt or lime.<sup>35</sup> Neither does King's account as printed in the London *Times*, though it comes after the proclamation by Lin describing what he will do.<sup>36</sup> The *Quarterly Review* noted that a "letter of Mr. King, detailing these preparations, and the process of launching the drug into the water, has appeared in all the newspapers."<sup>37</sup> It adds that the whole was "destroyed (it is alleged by a mixture of salt and lime), and then

---

1952, p. 42, translation mine. Originally titled, *Apologie pour l'Histoire au Metier d'historien*. Paris: Librairie Armand Colin, 1949.

<sup>35</sup> Allen, pp. 47-48 (GB); Warren, pp. 11-12 (GB).

<sup>36</sup> King, the *Times*, 1 Nov 1839, //infotrac.galegroup.com.

<sup>37</sup> Gifford, William et al. "Chinese Affairs," *The Quarterly Review*, vol. lxxv, no. cxxx, Dec 1839/1840. London: John Murray, 1840, p. 556 (GB).

## APOLOGIA

swept into the river."<sup>38</sup> *Alleged*, because King's account does not notice either salt or lime though Lin states he will use them. Lifted out of its original context, King's description alerts no one to the use of salt and lime. One single source almost completely ensures bias; one source abstracted guarantees it.

### E. DISCUSSION AND QUESTIONS

The most popular reference on the internet in the first decade of the 21st century is either the Burning Tale or King's future-history in which the opium was still going to be burned. Lin will always *burn* the opium. Is it not simply too good of a story? Governments and international anti-drug warriors have invested too much time, attention and money building up Lin as a hero, setting up monuments and statues in public spaces, and making blockbuster films of the *burning* of the opium to let this version of the story rest.

Lin will always *destroy* the opium with lime and salt. Historians will never consult with chemists nor will chemists read history. The lack of any personal experience with a subject will never stop historians from either writing about it or projecting their own fantasies upon a foreign culture. Biased eyewitnesses told a compelling story of a great evil overcome and biased modern authors will continue to tell the same. For many investigators the point is too small to be reconsidered. Finally, the event itself lacks both number and variety of eyewitness testimony.

A story that Lin seized the opium of the barbarians at the point of a bayonet, invited the most gullible to witness its public "destruction," extracted a predominantly morphine base and then resold this in the form of a remedy back to other people whose property he had also seized, serves no one. For the Chinese of Guangdong province Lin invents a disease, causes its outbreak, and then sells the newly minted sufferers a cure (made from their own property and that of the foreigners). Does the moral, the "Lassie moment" of this Alkaloid Tale, not have more to say about the zeal

---

<sup>38</sup> Gifford, p. 556 (GB).



## APPENDIX F

and self-righteous pharmacratic presumption of 19th, 20th and 21st century drug haters than about great evils overcome? But somewhere, someone might just be amused by the *chutzpah*.

## BIBLIOGRAPHY

---

- "A Brief History of Opiates," in CIN City News, Vol. 1, Summer 1999.
- Adams, Charles Francis. The Works of John Adams. Vol. 1. Boston: Little, Brown and Company, 1856 (GB).
- Adams, John. "Defense of the Soldiers in the Boston Massacre Trials" of December 1770, [www.quotations.com](http://www.quotations.com) and [www.law.umkc.edu](http://www.law.umkc.edu).
- "Afghanistan Opium Survey 2004," [unodc.org/pdf/afg/afghanistan\\_opium\\_survey\\_2004.pdf](http://unodc.org/pdf/afg/afghanistan_opium_survey_2004.pdf).
- "A History of Poppy Production," *Leaders in Poppy Production*, GlaxoWellcome, Australia, Ltd.
- Aldrich, M. A. The Search for a Vanishing Beijing. Hong Kong: Hong Kong University Press, 2006 (GB).
- "alkaline-earth metal," Encyclopaedia Britannica. 2007. Encyclopaedia Britannica Online. 1 Dec. 2007, <http://search.eb.com/eb/article-9110606>.
- "alkaloid." Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-9005753>.
- "Alkaloids," Encyclopaedia Britannica. Vol. 1. A to Antarah. Chicago, IL: William Benton, 1965.
- "Alkaloids," The New Encyclopedia Britannica. 15th edition. Chicago: E. B. Inc., 1998.
- Allen, Nathan. The Opium Trade. Lowell, MA: James P. Walker, 1853 (GB).
- "Amines," Encyclopaedia Britannica. Vol. 1. A to Antarah. Chicago, IL: William Benton, 1965.
- "amphotericism." Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-90000517>.
- "Analyse des travaux du troisième trimestre de 1825," *Journal de Pharmacie et des Sciences Accessoires*. Vol. 11. Paris: Chez Louis Fils, 1825 (GB).

## BIBLIOGRAPHY

- "Application for Licence to Grow *Papaver Somniferum*" courtesy of the Poppy Advisory and Control Board, Devonport, Tasmania.
- "Article XXVIII. - A Manual of Pharmacy. By William Thomas Brande, 1825, pp. 556," *Edinburgh Journal of Medical Science*. Vol. I. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826 (GB).
- "A Select Practical Formulary," *The Medical Times*. Vol. 12. London: J. Angerstein Carfrae, 1845 (GB).
- "A Short History," in *The Tasmanian Poppy Industry*, a brochure published by the Poppy Advisory and Control Board, Devonport, Tasmania.
- Baldwin, Ian T. "Damage-induced alkaloids in wild tobacco," Phytochemical Induction by Herbivores edited by Douglas W. Tallamy and Michael J. Raupp. New York: John Wiley and Sons, 1991.
- Barbier, Andre. "The Extraction of Opium Alkaloids," UNODC Bulletin of Narcotics 1950 Issue 3-003, [www.unodc.org/unodc/bulletin/bulletin\\_1950-01-01\\_3\\_page004.html](http://www.unodc.org/unodc/bulletin/bulletin_1950-01-01_3_page004.html).
- Bayer, Istvan. "Manufacture of alkaloids from the poppy plant in Hungary," [www.poppies.org](http://www.poppies.org).
- Beeching, Jack. Chinese Opium Wars. London: Hutchinson, 1975.
- Begbie, P. J., Captain. The Malaysian Peninsula, Embracing its History, Manners and Customs, etc. Madras, India: Printed for the author at the Vepery Mission Press, 1834 (GB).
- Bell, Ronald P., editor. "Acid-Base Reaction," Encyclopaedia Britannica. EB Online, 04/01/2008, <http://search.eb.com/eb/article-49247>.
- Bernard, William Dallas. Narrative of the Voyages and Service of the Nemesis, from 1840-1843, vol. 1. London: Henry Colburn, 1844 (GB).
- Bernheim, Bertrand M. The Story of Johns Hopkins: Four Great Doctors and the Medical School They Created. New York: McGraw-Hill Book Co., 1948.

## BIBLIOGRAPHY

- Bertol, Elisabetta, et al. "Nymphaea cults in ancient Egypt and the New World: a lesson in empirical pharmacology" in *Journal of the Royal Society of Medicine*, v. 97 (2), Feb 2004, [www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1079300](http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1079300).
- Bhattacharya, S. K., et al. "Psychopharmacological studies on (-)-nuciferine and its Hofmann degradation product atherosperminine," *Psychopharmacology*, vol. 59, no. 1, June 1978, [www.springerlink.com/content/r114315V32110062](http://www.springerlink.com/content/r114315V32110062).
- Bigelow, Jacob. Elements of Technology. Boston, MA: Hillard, Gray, Little and Wilkins, 1829 (GB).
- Bingham, J. Elliot. Narrative of the Expedition to China. Vols. I, II. 2nd edition. London: Henry Colburn, 1843 (GB).
- Bloch, Marc. Introduccion a la historia. Translated by Pablo Gonzalez Casanova and Max Aub. Mexico, D.F.: Fondo de Cultura Economica, S. A., 1952.
- Booth, Martin. Opium: A History. New York: St. Martin's Press, 1996.
- Bouillon-LaGrange, P.-J., et al, editors. "*Section de Pharmacie*," *Journal de pharmacie et des sciences accessoires*, vol. 13. Paris: Chez Louis Colas, 1827, <http://gallica.bnf.fr>.
- and Vogel. "An analytical Essay on the Scammonies of Aleppo and Smyrna, with some Observations on the reddening of Litmus by Resins," in *A Journal of Natural Philosophy, Chemistry and the Arts*. Vol. XXVII. William Nicholson, editor. London: W. Nicholson, 1810 (GB).
- Boullay, P.-F.-G. "*Extrait du mémoire de M. Sertuerner sur l'analyse de l'opium, sur la morphine et l'acide meconique; et observations de M. Robiquet sur le même sujet*," *Journal de Pharmacie et des sciences accessoires*, vol. 3. E.-J.-B. Bouillon-LaGrange, et al, editors. Paris: Chez L. Colas, 1817 (GB).
- Bradley, D. B. "Brief account of the Siamese Missionary Dispensary, at Bangkok, from August 8th, 1835 to October 5th, 1836," *CR*, vol. 5(GB).
- Brecher, Edward M., editor. The Consumers Union Report on Licit and Illicit Drugs. Boston: Little, Brown and Co., 1972.

## BIBLIOGRAPHY

- Bridgman, E. C. *The Chinese Repository*. Volumes 2-10. Canton: Bridgman, 1833-1840.
- Brock, William H. *Justus Van Liebig: The Chemical Gatekeeper*. Cambridge, UK: Cambridge University Press, 1997 (GB).
- Brutco, L. I. and Utkin, L. M. "Polybuffer Separation of Opium Alkaloids," *Pharmaceutical Chemistry Journal*, vol. 1, no. 1 (New York, Springer, 1967), translated from *Khimiko-Farmatsevticheskii Zhurnal*, No. 1, pp. 43-45, January, 1967, [www.springerlink.com/content/k905291g81414570/](http://www.springerlink.com/content/k905291g81414570/).
- Burns, Ralph A. *Fundamentas de Quimica*. 2nd ed. Translated by Hector Javier Escalona y Garcia. Naucalpan de Juarez, Mexico: Prentice Hall Hispanoamericana, S. A., 1996.
- Burrows, G. M. and A. T. Thomson, editors. *The London Medical Repository, Monthly Journal and Review*. Vol. VII. London: Printed for the Proprietors, 1817 (GB).
- Bynum, W. F. and Porter, Ray, editors. *Companion Encyclopedia of the History of Medicine*, vol. 2. London: Routledge, 1993.
- Callery, M. M. et al. *History of the Insurrection in China* (trans. J. Oxenford). New York: Paragon Books Reprint Corporation, 1969, from the "unaltered and unabridged" version of 1853 (GB).
- Capefigue, Jean-Baptiste. *Histoire des grandes opérations financières*. Vol. II. Paris: Libraire D'Amyot, 1856 (GB).
- Carney, Terry. "The History of Australian Drug Laws: Commercialism to Confusion?" in *Monash University Law Review*, Volume 7, June 1981.
- Carr, E. H. *Que es la historia?* Translated by Joaquin Romero Maura. Barcelona: Editorial Seis Barral, S. A., 1981.
- Chambers, W. and R., editors. *Chambers's Encyclopaedia - A Dictionary of Universal Knowledge for the People*. Vol. VI. London: W. & R. Chambers, 1864 (GB).
- Chang, Hsin-pao. *Commissioner Lin and the Opium War*. Cambridge, MA: Harvard University Press, 1964.

## BIBLIOGRAPHY

- Chang, Raymond. *Química*. 6th edition. Mexico, D.F.: McGraw Hill, 1999.
- Cheers, Gordon, editor. *Botánica: Guía ilustrado de plantas*, trans. J.G.L. Allende. Sydney: Random House Australia, 2006.
- "chemical compound," *Encyclopaedia Britannica*. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-79431>.
- Chevallier, Andrew. *Encyclopedia of Medicinal Plants*. London: DK Publishing, 1996.
- Chevallier, et al., editors. *Journal de Chimie, Médicale, de Pharmacie et de Toxicologie*. Vol. 3. Paris: Chez Bechet Jeune, 1827 (GB).
- "China: The Late Dispute," *Asiatic Journal and Monthly Messenger*, vol. 17. London: W. H. Allen and Company, 1835 (GB).
- Choy, Lee Khoon. "Understanding the Inscrutable Chinese," found at [www.easternstudies.com](http://www.easternstudies.com).
- Chulia, S., et al. "Vasodilator effects of liriodenine and norushinsunine, two aporphine alkaloids isolated from *Annona cherimola*, in rat aorta," *Pharmacology* (1995) 50, [www.ionchannels.org/showabstract.php?pmid=7568337](http://www.ionchannels.org/showabstract.php?pmid=7568337).
- Chung, Tan. *China and the Brave New World: A Study of the Origins of the Opium War (1840-1842)*. Durham, NC: Carolina Academic Press, 1978.
- Clark, Ronald D. and Robert L. S. Amai. *Chemistry: The Science and the Scene*. Santa Barbara, CA: Hamilton Publishing Company, 1975.
- Collis, Maurice. *Foreign Mud*. New York: Alfred A. Knopf, 1947.
- Committee on Foreign Affairs. *United States Licit Opium Imports: Foreign Policy Issues*. Washington, D.C.: U.S. Government Printing Office, May 1989.
- Compilation Group for the History of Modern China. *The Opium War*. Peking: Foreign Language Press, 1976.

## BIBLIOGRAPHY

- Davenport-Hines, Richard. The Pursuit of Oblivion: A Global History of Narcotics 1500-2000. London: Weidenfeld and Nicolson, 2001 (GB).
- Davis, J. F. China, During the War and Since the Peace. London: Spottiswoodes and Shaw, 1852 (GB).
- De Pagador, Y. A. Pueblos, Razas y Venenos. Santiago, Chile: Ediciones Ercilla, 1936.
- Derosne, Charles. "*Memoir sur l'Opium*," *Annales de Chimie*, vol. 45. Paris: Chez Crochard, 1803 (UM).
- Dickens, Charles. Household Words: A Weekly Journal, vol. XVI. New York: John Jansen's Co., 1858 (GB).
- Dikötter, Frank with Lars Laamann and Zhou Xun. Narcotic Culture: A History of Drugs in China. Chicago, IL: University of Chicago Press, 2004.
- Dodgen, Randall A. Controlling the Dragon: Confucian Engineers and the Yellow River in Late Imperial China. Honolulu: University of Hawaii Press, 2001 (GB).
- Doolan, Paul. "Time for Dutch Courage in Indonesia," History Today, March 97, volume 47, Issue 3.
- Doskey, John S., editor. The European Journals of William Maclure. Philadelphia, PA: American Philosophical Society, 1988 (GB).
- Drews, Jurgen. In Quest of Tomorrow's Medicines. New York: Springer-Verlag, 2003 (GB).
- Dumas, Alexandre. The Count of Monte-Cristo. Vol. II. London: Chapman and Hall, 1846 (GB).
- Duncan, Andrew. Supplement to the Edinburgh New Dispensatory. Edinburgh: Bell and Bradfute, 1829 (GB).
- Eberhard, Wolfram. A History of China. London: Routledge, 2005 (GB).
- Edmonds, John W. Origin and Progress of the War Between England and China. New York: Newburgh Lyceum, 1841 (GB).
- Elias, David. "Law Review would be opiate for Tasmania," *The Age*, Section 4, Business, Saturday, 8 April, 2000.

## BIBLIOGRAPHY

- Encyclopedia Britannica. Vol. 20. 11th edition. London: Cambridge University Press, 1911.
- Encyclopaedia Britannica; Or, a Dictionary of Arts, Sciences and Miscellaneous Literature. Sixth edition. Vol. V. Edinburgh: Archibald Constable and Company, 1823.
- Escobedo, Antonio. *Historia general de las drogas*. Madrid: Espasa-Calpe, S. A., *Colección Espasa Forum*, 1998.
- "Extraction of Alkaloids from Opium," WO/2005/123743, [www.wipo.int/pctdb/en/wo.jsp?wo=2005123743](http://www.wipo.int/pctdb/en/wo.jsp?wo=2005123743).
- Fairbank, John King and Kwang-Ching Liu, editors. The Cambridge History of China. Volume 2, Late Ch'ing 1800-1911, Part 2. Cambridge, England: Cambridge University Press, 1980 (GB).
- Fay, Peter Ward. The Opium War (1840-1842). Chapel Hill, NC: University of North Carolina Press, 1975.
- Feige, Chris and Miron, Jeffrey A. "The Opium Wars, Opium Legalization, and Opium Corruption in China," April 2005, <http://scholar.google.com>.
- Fine, Leonard W. Chemistry. 2nd ed. Baltimore, MD: William and Wilkins, 1978.
- Flahaut, J. "The Derosne, Parisian pharmacists from 1779 to 1855," *Revue d'histoire de la pharmacie*, (Paris) 2005 Jan; 53 (346), [www.unboundmedline.com](http://www.unboundmedline.com).
- Foronoff, Paul. *Variety*, 23 June 1997, [www.highbeam.com](http://www.highbeam.com).
- Fownes, George. Elementary Chemistry, Theoretical and Practical. Philadelphia, PA: Blanchard and Lea, 1855 (GB).
- Frankenberger, William T. Environmental Chemistry of Arsenic. New York: Marcel Dekker, Inc., 2002 (GB).
- Frazer, James George. The Golden Bough: A Study in Magic and Religion. London: Penguin Books, 1996.
- Freemantle, Michael. "Morphine," *Chemical and Engineering News*, Vol. 83, Issue 25 (6/20/05), <http://pubs.acs.org>.



## BIBLIOGRAPHY

- Galloway, John, Deputy Minister of Health, Tasmania.  
 Unpublished notes of telephone interview.
- Garritz, A. and Chamizo, J. A. Quimica. Mexico, D. F.: Addison Wesley, 1994.
- Gay-Lussac. "Reflections on Volcanoes," a paper read before the Royal Academy of Sciences at Paris and published as "Theory of Volcanoes" in *The Monthly Magazine or British Register*. Vol. LX. Part Two. London: George B. Whittaker, 1825 (GB).
- Gee, Alison Dakota. "Xie's Epic Victory," [www.asiaweek.com](http://www.asiaweek.com).  
 "General Conditions," a one-page hand-out on file at the Tasmanian Poppy and Advisory Control Board, Devonport, Tasmania.
- Gifford, William et al, editors. "Chinese Affairs," *The Quarterly Review*, vol. LXV, Dec. 1839/Mar. 1840. London: John Murray, 1840 (GB).
- Gilman, E. F. and D. G. Watson. "*Firmiana simplex*, Chinese parasol tree," Fact Sheet ST-259, Nov. 1993, USFS, <http://hort.ufl.edu/trees/firsima.pdf>.
- Goldfrank, Lewis R. Goldfrank's Toxicologic Emergencies, 7th ed. New York: McGraw-Hill Professional, 2002 (GB).
- Gorak, Jan, editor. Collected Works of Northrop Frye. Toronto, Canada: University of Toronto Press, 2003 (GB).
- Gossop, Michael. Living with Drugs. Fourth Edition. Hants, England: Arena, 1996.
- Graham, Thomas. Elements of Chemistry. Part 3 - Organic Chemistry. London: Hippolyte Bailliere, 1842 (GB).
- Gregory, William. "On a Process for Preparing Economically the Muriate of Morphia," *The Edinburgh Medical and Surgical Journal*, volume 35. Edinburgh: Adam Black, 1831 (GB).  
 ----- A Handbook of Organic Chemistry. 4th edition. London: Waltan and Maberly, 1856 (GB).
- Grob, Gerald N., editor. Public Policy and the Problem of Addiction: Four Studies, 1914-1924. New York, NY: Arno Press, 1981 (GB).
- "Guru's Big Guide to Chemistry," [www.poppies.org](http://www.poppies.org).

## BIBLIOGRAPHY

- Gutzlaff, Karl F. A Sketch of Chinese History, Ancient and Modern, Comprising a Retrospect of the Foreign Intercourse and Trade with China. Vol. 1. New York: John P. Haven, 1834 (GB).  
 ----- Journal of Three Voyages Along the Coast of China.  
 London: Frederick Westley and A. H. Davis, 1834 (GB).  
 ----- The Life of Taou-kwang, Late Emperor of China.  
 London: Smith, Elder and Co., 1852 (GB).
- Hamilton, Margaret with Allan Kellehear and Greg Rumbold, editors. Drug Use in Australia. Melbourne, Australia: Oxford University Press, 1998.
- Hanes, W. T. and Frank Sanello. The Opium Wars: The Addiction of One Empire and the Corruption of Another. Naperville, IL: Sourcebooks, Inc., 2002 (GB).
- Henry and Plisson. "*Mémoire pour faire suite à l'histoire de la Quinine, de la Cinchonine et de l'Acide quinique,*" *Annales de Chimie et de Physique*, eds. Gay-Lussac and Arago, vol. 35. Paris: Chez Crochard, 1827 (GB).
- Henry, William. The Elements of Experimental Chemistry. Philadelphia, PA: Robert DeSilver, 1819, 1831 (GB).
- Hershenson, Bruce. Hong Kong at the Handover. Lanham, MD: Lexington Books, 1999 (GB).
- Heumann, W. R. "The Manufacture of Alkaloids from Opium," [www.unodc.org/unodc/en/bulletin/bulletin\\_1950-01-01\\_page007.html](http://www.unodc.org/unodc/en/bulletin/bulletin_1950-01-01_page007.html).
- Hilderbrand, K. S. "Preparation of Salt Brines for the Fishing Industry," Oregon State University, 1998, <http://seagrant.oregonstate.edu/sgpsubs/onlinepubs/h99002.pdf>.
- Hoblyn, Richard D. A Dictionary of Terms used in Medicine and the Collateral Sciences. Philadelphia, PA: Blanchard and Lea, 1856 (GB).
- Hochschild, Adam. "The Slavery Abolition Act 1833," [www.socialistworker.org.uk](http://www.socialistworker.org.uk).
- Hodge, Hugh L., M. D. *North American Medical and Surgical Journal.* Vols. I, II. Philadelphia, PA: J. Dobson, 1826 (GB).

## BIBLIOGRAPHY

- Hodgson, Barbara. In the Arms of Morpheus. Buffalo, NY: Firefly Books, 2001.
- Hoe, Susanna and Derek Roebuck. The Taking of Hong Kong: Charles and Clara Elliot in China Waters. Richmond, England: Curzon Press, 1999 (GB).
- Hummel, A. W., editor. Eminent Chinese of the Ch'ing Period (1644-1912). Washington, D.C.: USGPO, 1943.
- Hunt, Janin. The India-China Trade in the 19th Century. Jefferson, NC: McFarland, 1999 (GB).
- Huskisson, H. Owen. "Salt - The Sources from Whence it is Obtained, and the Processes Involved in its Manufacture," *Journal of the Society of Arts*, vol. 1. London: George Bell, 1853 (GB).
- Huxtable and Schwarz, *Molecular Interventions* 1:189-191 (2001), <http://molinterv.aspetjournals.org>.
- Inglis, Brian. The Forbidden Game. New York: Charles Scribner's Sons, 1975, [www.psychedelibrary.org/inglis.htm](http://www.psychedelibrary.org/inglis.htm).
- International Opium Convention* (The Hague) 1912, <http://www.austlii.edu.au/au/other/dfat/treaties/1920/20.html>.
- Internet Sites: <http://ancienthistory.about.com>,  
<http://answers.yahoo.com>, <http://arts.cuhk.edu.hk>,  
<http://classics.mit.edu>, <http://dictionary.reference.com>,  
<http://encarta.msn.com>, <http://en.wikipedia.org>,  
<http://gimbo.org.uk>, <http://historyliterature.homestead.com>,  
<http://home.olemiss.edu>, <http://hyperphysics.phy-astr.gsu.edu>,  
<http://ireland-stories.ie>, <http://onlinedictionary.datasegment.com>,  
<http://palimpsest.stanford.edu>, <http://scifun.chem.wisc.edu>,  
<http://wiki.answers.com>, [www.1911Encyclopedia.org](http://www.1911Encyclopedia.org),  
[www.ag.ndsu.edu](http://www.ag.ndsu.edu), [www.answers.com](http://www.answers.com), [www.anti-narcotics.psd.gov.jo](http://www.anti-narcotics.psd.gov.jo),  
[www.arabcartage.com](http://www.arabcartage.com), [www.ars-grin.gov](http://www.ars-grin.gov),  
[www.askoxford.com](http://www.askoxford.com), [www.aviewoncities.com](http://www.aviewoncities.com),  
[www.beijingguide.com](http://www.beijingguide.com), [www.britannica.com](http://www.britannica.com),  
[www.buddhanet.net](http://www.buddhanet.net), [www.cem.msu.edu](http://www.cem.msu.edu),  
[www.chem.bris.ac.uk](http://www.chem.bris.ac.uk), [www.chemcalc.org](http://www.chemcalc.org),

## BIBLIOGRAPHY

[www.chemguide.co.uk](http://www.chemguide.co.uk), [www.chem.ucalgary.cn](http://www.chem.ucalgary.cn),  
[www.cheneylime.com](http://www.cheneylime.com), [www.ch.ic.ac.uk](http://www.ch.ic.ac.uk),  
[www.chinaculture.org](http://www.chinaculture.org), [www.china.org.cn](http://www.china.org.cn),  
[www.chinapages.com](http://www.chinapages.com), [www.chymist.com](http://www.chymist.com),  
[www.clearchinese.com](http://www.clearchinese.com), [www.dangjing.com](http://www.dangjing.com),  
[www.darwinisme.org](http://www.darwinisme.org), [www.didier-pol.net](http://www.didier-pol.net), [www.dongguan-hotels.com](http://www.dongguan-hotels.com),  
[www.easynewyorkcity.com](http://www.easynewyorkcity.com),  
[www.explorechinatown.com](http://www.explorechinatown.com), [www.freedictionary.com](http://www.freedictionary.com),  
[www.fromoldbooks.org](http://www.fromoldbooks.org), [www.fundinguniverse.com](http://www.fundinguniverse.com),  
[www.gcsechemistry.com](http://www.gcsechemistry.com), [www.henriettesherbal.com](http://www.henriettesherbal.com),  
[www.inchem.org](http://www.inchem.org), [www.infomutt.com](http://www.infomutt.com), [www.invasive.org](http://www.invasive.org),  
[www.kirjasto.sci.fi](http://www.kirjasto.sci.fi), [www.letiecq.org](http://www.letiecq.org), [www.linnaeus.uu.se](http://www.linnaeus.uu.se),  
[www.macaadata.com](http://www.macaadata.com), [www.mandarintools.com](http://www.mandarintools.com), [www.mdbg.net](http://www.mdbg.net),  
[www.measuringworth.com](http://www.measuringworth.com), [www.medicinenet.com](http://www.medicinenet.com),  
[www.medterms.com](http://www.medterms.com), [www.med.univ-angers.fr](http://www.med.univ-angers.fr), [www.merck.de](http://www.merck.de),  
[www.merriampark.com](http://www.merriampark.com), [www.monashscientific.com.au](http://www.monashscientific.com.au),  
[www.mychinatravel.net](http://www.mychinatravel.net), [www.nationalreview.com](http://www.nationalreview.com),  
[www.newsgd.com](http://www.newsgd.com), [www.nps.gov](http://www.nps.gov), [www.oxforddnb.com](http://www.oxforddnb.com),  
[www.patrimoine-de-france.org](http://www.patrimoine-de-france.org), [www.perseus.tufts.edu](http://www.perseus.tufts.edu),  
[www.phy.cuhk.edu.hk](http://www.phy.cuhk.edu.hk), [www.plantamed.com.br](http://www.plantamed.com.br),  
[www.poncepilateagain.com](http://www.poncepilateagain.com), [www.questia.com](http://www.questia.com),  
[www.republicanchina.org/qing.html](http://www.republicanchina.org/qing.html), [www.republicchina.org](http://www.republicchina.org),  
[www.sacred-texts.com](http://www.sacred-texts.com), [www.saltinstitute.org](http://www.saltinstitute.org),  
[www.semanda.com](http://www.semanda.com), [www.shamanic-extracts.com](http://www.shamanic-extracts.com),  
[www.sudoc.abes.fr](http://www.sudoc.abes.fr), [www.syvum.com](http://www.syvum.com), [www.theoi.com](http://www.theoi.com),  
[www.tigernt.com](http://www.tigernt.com), [www.travelchinaguide.com](http://www.travelchinaguide.com),  
[www.travelguide.com](http://www.travelguide.com), [www.un.org/NewLinks/drugs](http://www.un.org/NewLinks/drugs),  
[www.vanderkrogt.net](http://www.vanderkrogt.net), [www.webster-dictionary.net](http://www.webster-dictionary.net),  
[www.westegg.com](http://www.westegg.com), [www.yellowbridge.com](http://www.yellowbridge.com), [www.zhong.wen](http://www.zhong.wen)

Jackson, Kenneth C. and Arthur G. Lipmann. "Opioid Analgesics," Practical Pain Management, 3rd edition, C. David Tollison, et al., editors. Philadelphia, PA: Lippincott, Williams and Wilkins, 2002 (GB).

## BIBLIOGRAPHY

- J. B. Ps. "Alkali," Encyclopaedia Britannica. Vol. 1. Chicago, IL: William Benton, 1965.
- Johan, K. and K. Ahmad. "Detoxification of lathyrus sativus," *Food and Nutrition Bulletin*, vol. 6, no. 2, June. Tokyo, Japan: United Nations University Press, 1984, [www.unu.edu/unupress/food/8F062e/8F062E07.htm](http://www.unu.edu/unupress/food/8F062e/8F062E07.htm).
- Johnson and Johnson 1996 Annual Report*, Worldwide Family of Companies, Asia-Pacific, Africa, [http://www.jnj.com/news\\_finance/nf\\_ar\\_wwfoc.html](http://www.jnj.com/news_finance/nf_ar_wwfoc.html).
- Jones, Barbara. "Working with lime," The Art of Natural Building. J. Kennedy, et al, editors. Gabriola Island, B.C., Canada: New Society Publishers, 2002.
- Kabay, John J. Janos Kabay: The Life of an Inventor. Harbord, Australia: John Kabay, 1990.
- Kane, Robert. Elements of Chemistry. Dublin: Hodges and Smith, 1842 (GB).
- Karch, Stephen B. A Brief History of Cocaine: From Inca Monarchs to Cali Cartels. 2nd edition. Boca Raton, FL: CRC Press, 2006 (GB).
- Katz, Donald A. "Mystery Solutions," [www.chymist.com/mystery%20solutions.pdf](http://www.chymist.com/mystery%20solutions.pdf).
- Keih, K'ung. Doctrine of the Mean. Transl. James Legge. London: Trübner, 1861.
- Keqiang Ye, et al. "Opium Alkaloid Noscapine is an antitumor agent that arrests metaphase and induces apoptosis in dividing cells," *Cell Biology, Pro. Natl. Acad. Sci. USA*, vol. 95, Feb. 1998, [www.pnas.org](http://www.pnas.org).
- King, Charles W. "Imperial Edict respecting the Surrendered Opium, the Process of Destroying it, and etc. (Extracts from Letters of C. W. King, Esq. of Canton to J. Ballestier, Esq.)," *The London Times*, 1 November 1839, Issue 17188, column C, [http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19?url=rc2\\_TTDA\\_2\\_\\_11/1/1839\\_\\_](http://infotrac.galegroup.com/itw/infomark/337/370/18317361w19?url=rc2_TTDA_2__11/1/1839__).

## BIBLIOGRAPHY

- The Opium Crisis. London: Edward Suter, Duncan and Malcolm, Hutchard and Son, 1839 (GB).
- Kramer, Ione. All the Tea in China. San Francisco, CA: China Books, 1990 (GB).
- Krivanek, Jara. Heroin Myths and Reality. Sydney: Allen and Unwin, 1988.
- Kuo, P. C. A Critical Study of the First Anglo-Chinese War with Documents. Taipei: Ch'eng Wen Publishing Co., 1970 (a reprint of the 1935 edition published in Shanghai).
- La Historia, Colección China*. Beijing: *Ediciones en Lenguas Extranjeras*, 1984.
- Latimer, Dean and Jeff Goldberg. Flowers in the Blood. New York: Franklin Watts, 1981.
- Laughlin, J.C. and D.I. Morris. Identification of Prohibited and Non-prohibited Species of Poppy Growing in Tasmania. Poppy Advisory and Control Board, Tasmania, Australia.
- Le Pichon, Alain. China Trade and Empire. Oxford, England: Oxford University Press, 2006 (GB).
- Lesley, et al., editors. The Pharmaceutical Industry: A Guide to Historical Records. Aldershot, England: Ashgate Publishing, 2003 (GB).
- Lewis, Charlton T. and Short, Charles. A Latin Dictionary. Oxford: Clarendon Press, 1879, [www.perseus.tufts.edu](http://www.perseus.tufts.edu).
- Liedekerke, Arnould de. La Belle Epoque de l'opium: Anthologie litteraire de la drogue de Charles Baudelaire a Jean Cocteau. Paris: Le Spinx, 1984.
- "Lime-Treated Soil Construction Manual - Lime Stabilization and Lime Modification," National Lime Association, Bulletin 326. 11th edition. January 2004. From American Road Builders Association Subcommittee on Lime Stabilization, ARBA Technical Bulletin 243, 1959, [www.lime.org/Construct104.pdf](http://www.lime.org/Construct104.pdf).
- Lin, Henry C. K. "China: A Case of Self-Delusion," 14 May 2003, [www.atimes.com](http://www.atimes.com).

## BIBLIOGRAPHY

- "Lin Tse-hsü," The New Encyclopaedia Britannica. 15th edition. Chicago, IL: E. B., Inc., 1977.
- Lister, Ted. "The thermodynamics and equilibria involved in the Solvay process for producing sodium carbonate," part of "Sodium Carbonate - A Versatile Material," [www.chemsoc.org/pdf/LearnNet/rsc/SodiumCarb\\_sel.pdf](http://www.chemsoc.org/pdf/LearnNet/rsc/SodiumCarb_sel.pdf).
- Liu, Lydia He. The Clash of Empires. Cambridge: Harvard University Press, 2004 (GB).
- Lopez-Muñoz, Francisco and Cecilio Alamo. "La síntesis de la morfina: del milagro de la analgesia a la maldición de las dependencias (The Isolation of Morphine: From the miracle of analgesia to the curse of addiction)," *Redes de Investigación en Medicamentos*, Madrid Farmaindustria, 9 July 2007, [www.ciberer.es/documentos/REDES%209%20BAJA.pdf](http://www.ciberer.es/documentos/REDES%209%20BAJA.pdf).
- Lusane, Clarence. Pipe Dream Blues. Cambridge, MA: South End Press, 1991 (GB).
- Ma, et al. "Process for Extracting and Purifying Morphine from Opium," U.S. Patent 6,054,584, [www.erowid.org/archive/rhodium/chemistry/morphextr.html](http://www.erowid.org/archive/rhodium/chemistry/morphextr.html).
- "Management of Pain – A Growth Industry," Tasmanian Alkaloids Poppy Grower's Bulletin, No. 40, July, 1999.
- Mansfield, David. "An Analysis of Licit Opium Poppy Cultivation: India and Turkey," April 2001, [www.pa-chouvy.org/Mansfield2001AnalysisLicitOpiumPoppyCultivation.pdf](http://www.pa-chouvy.org/Mansfield2001AnalysisLicitOpiumPoppyCultivation.pdf).
- Mao Jin Li, editor, et al. Diccionario Moderno Español-Chino Chino Español. Beijing: Wei Yu Jiao Xue Yu Yan Jiu Chu Ban She, 1991.
- "Materia Medica and General Therapeutics," *The American Journal of the Medical Sciences*. Vol. XXI. Philadelphia, PA: Carey, Lea and Blanchard, 1837(GB).
- Maxwell, S. A. and staff, producers and compilers. Drug Houses of Australia, Ltd. Tasmania: L. Fairthorne and Son, Pty., Ltd., 1945.

## BIBLIOGRAPHY

- McCoy, Alfred W. The Politics of Heroin in Southeast Asia. New York: Harper and Row, 1972.
- Merlin, Mark David. On the Trail of the Ancient Opium Poppy. London: Associated University Presses, 1984.
- Micklebaugh, Rod. "Chinese urged to 'wash away shame' in Hong Kong," *Milwaukee Journal Sentinel*, 12 June 1997 found at <http://findarticles.com>.
- "Morpheus," Encyclopaedia Britannica. Vol. 15. Maximinus to Naples, Kingdom of. Chicago, IL: William Benton, 1965.
- "Morphine," The New Encyclopedia Britannica. 15th edition. Chicago: E. B. Inc., 1998.
- Morris, R. T. "What is a Quack? He ever applies to the public, Dr. Morris says," *New York Times*, Dec. 1, 1912, Sunday, p. 16. *New York Times Archives*.
- Morrison, R. A Dictionary of the Chinese Language in Three Parts. Part III. Macao, China: Printed at the Honorable East India Company's Press by P. P. Thoms, 1822 (GB).
- Morse, H. B. Chronicles of the East India Company Trading to China. Five volumes. Cambridge, MA: Harvard University Press, 1926.
- Morson, Anthony. Operative Chymist. Amsterdam: Rodopi, 1997 (GB).
- Mosbach, Ernest Wilhelm. Botanica Indigena de Chile. Santiago, Chile: Editorial Andres Bello, 1992.
- Muñoz, Fernando. Plantas Medicinales y Aromaticas. Madrid: Ediciones Mundi-Prensa, 2002.
- Murier, Horace. "Parallelism in Alkaloid-Alkali Quids" in American Anthropologist, New Series, Vol. 41, No. 4 (Oct-Dec, 1939), <http://links.jstor.org>.
- Murray, et al. Encyclopaedia of Geography. Philadelphia, PA: Lea and Blanchard, 1839 (GB).
- An Historical and Descriptive Account of China. Edinburgh: Oliver and Boyd, 1836, 1843.



## BIBLIOGRAPHY

- "Operations," in *Tasmanian Alkaloids*, a brochure published by Tasmanian Alkaloids Pty Ltd, Westbury, Tasmania.
- "Opiates: Wholesale, street prices and purity levels, prices in Europe and the USA 1990-2005," [www.unodc.org/pdf/WDR\\_2006/wdr\\_2006\\_chap5\\_opium.pdf](http://www.unodc.org/pdf/WDR_2006/wdr_2006_chap5_opium.pdf).
- "Opium - Its beneficial effects on Mr. Wilberforce and Mr. Crabbe," *Canton Register*, vol. 11, Thursday, 30 Oct 1838, no. 44.
- "Opium Poppy Cultivation and Heroin Processing in Southeast Asia," U.S. Department of Justice, Drug Enforcement Administration, March 2001, DEA - 20026, <http://www.shaps.hawaii.edu/drugs/dea20026/dea20026.html>, <http://opioids.com/jh/index.html>, [www.erowid.org/archive/rhodium/chemistry/opium.html](http://www.erowid.org/archive/rhodium/chemistry/opium.html).
- Orfila and Olivier. "Of the action of Codiate of Morphia, upon the animal economy; a series of experiments by MM. Orfila, and Olivier of Angers. - From the *Journal de Chimie Medicale*, Oct. 1825," *The Edinburgh Journal of Medical Science*, Vol. II. July 1, 1826 to January 1, 1827. Edinburgh: Maclachlan and Stewart, 1826, (GB).
- O'Shaughnessy. "Opium, Narcotine, and the Muriate of Narcotine," *Canton Register*, 25 October 1838 (UM).
- "Our Relations with China," *The British and Foreign Review*, volume 10. London: Richard and J. E. Taylor, 1840 (GB).
- Oxford Dictionary of National Biography, [www.oxforddnb.com/view/article/11475?docPos=23224](http://www.oxforddnb.com/view/article/11475?docPos=23224).
- "Parisian Medical Intelligence," *The London Lancet*, eds. Thomas Wakely, et al. Vol. II. New York, NY: \_\_\_\_\_, 1860, (GB).
- Parker, Peter. "First report of the Medical Missionary Society's Hospital at Macao, for the quarterly term beginning 5th July, and ending 1st October, 1838," *CR*, vol. 7 (GB).
- Reports of the Ophthalmic Hospital at Canton, 1-10. *Canton Repository*, vols. 4-8. Canton: Printed for the Proprietors, 1840 (GB).

## BIBLIOGRAPHY

- Parrish, Edward. An Introduction to Practical Pharmacy. 2nd edition. Philadelphia, PA: Blanchard and Lea, 1859 (GB).
- Parssinen, Terry M. and Kathryn Meyer. Webs of Smoke. Lanham, MD: Rowman and Littlefield, 1998 (GB).
- Pelletier, J. "*Nouvelles Recherches sur l'Opium*," *Annales de Chimie et de Physique*, vol. 50. Paris: Chez Crochard, 1832.
- and Guibourt. "*Rapport de MM. Pelletier et Guibourt, sur un mémoire ayant pour titre: Recherches sur l'emploi des sels neutres dans les analyses végétales et application de cette méthode à l'opium, par M. Robinet*," *Journal de Pharmacie et des Sciences Accessoires*, vol. 11. P.-J. Bouillon-Lagrange, et al., editors. Paris: Chez Louis Colas Fils, 1825 (GB).
- Pelletier, S.W. "The Plant Alkaloids – General Information" Chemistry of the Alkaloids, S.W. Pelletier, editor. New York: Van Nostrand Reinhold Company, 1970.
- Pelouze, J. and Fremy, E. Traité de Chimie Générale. Second edition. Volume four. Paris: Librairie de Victor Masson, 1855, (GB).
- Penfield, Wilder. "Halsted of Johns Hopkins: The man and his problem as described in the secret records of William Osler." JAMA, 210 (22 December 1969).
- Perreira, Jonathan. The Elements of Materia Medica and Therapeutics. Third American edition. Vol. II. Philadelphia, PA: Blanchard and Lea, 1854, p. 77 (GB).
- Phillips, John S. et al. Química: Conceptos y Aplicaciones. Trans. Maria del Carmen Ramirez Medeles and Rosa Zugazagoitia Herranz. Mexico, D.F.: McGraw Hill, 2000.
- Pickowitz, Paul G. "Zheng Junli, Complicity and the Cultural History of Socialist China, 1949-1976," The History of the PRC (1949-1976), Julia C. Strauss, editor. The New China Quarterly Special Issues New Series, No. 7. Cambridge, UK: Cambridge University Press, 2007 (GB).
- Pilkington, James. The Artist's Guide and Mechanic's Own Book. Boston, MA: Lanborn, Carter and Bazen, 1856, p. 38 (GB).
- Primary Information Services, [www.primaryinfo.com/projects/alkaloids.htm](http://www.primaryinfo.com/projects/alkaloids.htm).

## BIBLIOGRAPHY

- Report of the First and Second Meetings of the British Association of the Advancement of Science.* London: John Murray, 1835 (GB).
- Raffauf, Robert F. Handbook of Alkaloids and Alkaloid-Containing Plants. New York: John Wiley and Sons, 1970.
- Regnault, M. V. Elements of Chemistry. Second edition. Vol. I. Translated by T. Forrest Betton. Philadelphia, PA: Clark and Hesser, 1853 (GB).
- Report of the International Narcotics Control Board for 1999.* United Nations Publications E/INCB/1999/1, at [www.incb.org](http://www.incb.org).
- "Report of M. Pelletier and M. Guibourt, on a Memoir entitled, "Researches on the employment of Neutral Salts in the analysis of Vegetables, and the application of this method to Opium, by M. Robinet," *Edinburgh Journal of Medical Science.* Vol. 1. Jan-Jul 1826. Edinburgh: Maclachlan and Stewart, 1826, (GB).
- "*Revue médicale française,*" *Annales de Chimie et de Physique*, vol. 59. Paris: Chez Crochard, 1835, (GB).
- Ripley, George and Charles A. Dana, editors. The New American Cyclopaedia, A popular Dictionary of General Knowledge. Vol. II. New York: D. Appleton and Company, 1859 (GB).
- Robertson, Montgomery. "Process for preparing pure Muriate of Morphia," *American Journal of the Medical Sciences*, volume 10. Philadelphia, PA: Carey and Lea, 1832 (GB).
- Robin, Ron T. Scandals and Scoundrels. Berkeley, CA: University of California Press, 2004 (GB).
- Robinet, S. "*Recherches sur l'Emploi des sels neutres dans les analyses végétales, et application de ce procédé à l'opium,*" *Annales de Chimie et de Physique.* Volume 30. Paris: Chez Crochard, 1825 (GB).
- "On a new Method of Purifying Crystals," *The Edinburgh New Philosophical Journal*, Robert Jameson, conductor. Edinburgh: Adam Black, et al., 1826 (GB).
- Robiquet. "*Observations sur le Mémoire de M. Sertuerner, relatif à l'analyse de l'Opium,*" *Annales de Chimie et de Physique*, eds. Gay-Lussac and Arago. Volume 5. Paris: Chez Crochard, 1817.

## BIBLIOGRAPHY

- "Obserations sur le Mémoire de M. Robinet relatif à une nouvelle analyse de l'Opium," *Journal de Pharmacie*. Vol. 12. Paris: Chez Louis Colas Fils, 1826 (GB).
- "Section de Pharmacie," *Journal de Chimie, Médicale, de Pharmacie et de Toxicologie*, vol. 3. Paris: Chez Béchét Jeune, 1827 (GB).
- and Boutron. "Sur le café," *Journal de Pharmacie et des Sciences Accessoires*, vol. 23. Paris: Chez Louis Colas, 1837 (GB).
- Rudgley, Richard. The Alchemy of Culture: Intoxicants in Society. London: British Museum Press, 1993.
- The Encyclopedia of Psychoactive Substances. New York: Little, Brown and Co., 1998, [www.biopsychiatry.com/tobacco](http://www.biopsychiatry.com/tobacco).
- Salisbury, Harrison E. China: 100 Years of Revolution, <http://ias.berkeley.edu>.
- Sampson, J.A. and E.S.C. Weiner, preparers. The Oxford English Dictionary. 2nd Edition. Oxford: Clarendon Press, 1989.
- Schiff, Paul L. "Opium and its Alkaloids," *American Journal of Pharmaceutical Education*, Summer 2002, [http://findarticles.com/p/articles/mi\\_qa3833/is\\_200207/ai\\_n9107282](http://findarticles.com/p/articles/mi_qa3833/is_200207/ai_n9107282).
- Séguin, Armand. "Premier Mémoire sur l'Opium," *Annales de Chimie*. Volume 92. Paris: Chez Crochard, 1814.
- "separation and purification." Encyclopaedia Britannica. 2008. Encyclopaedia Britannica Online. 4 Jan. 2008, <http://search.eb.com/eb/article-80493>.
- Sertuerner, F. W. "Ueber das Morpium," *Annalen der Physik*, ed. L. W. Gilbert. Volume 55. Leipzig: Joh. Abrosius Barth, 1817 (UM).
- "Ueber eins der fürchterlichsten Gifte der Pflanzenwelt," *Annalen der Physik*. Volume 57. Leipzig: Joh. Abrosius Barth, 1817 (UM).

## BIBLIOGRAPHY

- "Bemerkungen über der Herrn Robiquet's  
*Abhandlung über das Opium*," *Annalen der Physik*. Ed. L. W.  
 Gilbert. Volume 59. Leipzig: Joh. Ambrosius Barth, 1818 (UM).
- Shouyi, Bai, editor-in-chief. *Breve Historia de China: Desde la  
 antigüedad hasta 1919*. Beijing: Ediciones en Lenguas  
 Extranjeras, 1984.
- Shuck, J. L. *Portfolio Chinesis: A Collection of Authentic State  
 Papers*. Macao, China: Shuck, 1840 (GB).
- Single Convention on Narcotic Drugs* (New York) 1961, as amended  
 by the 1972 Protocol, [www.incb.org/e/conv/1961/cover/html](http://www.incb.org/e/conv/1961/cover/html).
- Slade, John. *Narrative of the Late Proceedings and Events in  
 China*. China: Canton Register Press, 1839, (GB).
- Small, Lyndon F. *Chemistry of the Opium Alkaloids*. Supplement  
 No. 103 to the Public Health Reports, U. S. Treasury  
 Department, Public Health Service. Washington, D. C.:  
 USGS Printing Office, 1932.
- Smith, James Edward. *English Botany*. 2nd edition. Vol. XI.  
 London: Judith Sowerby, 1844 (GB).
- Smith, W. R. President, Poppy Grower's Association, Tasmania.  
 Unpublished notes from a telephone interview.
- Snow, C. P. *The Two Cultures and A Second Look*. Cambridge:  
 Cambridge University Press, 1998 (GB).
- Sonnedecker, Glenn. *Kremer and Urdang's History of Pharmacy*.  
 Philadelphia, PA: J. P. Lippincott, 1976 (GB).
- Southern Society for Clinical Investigation. *American Journal of the  
 Medical Sciences*. Volume 21. Philadelphia, PA: Carey Lea  
 and Blanchard, 1837 (GB).
- Sparks, Jared, editor et al. *American Almanac and Repository of  
 Useful Knowledge*. Boston: David H. Williams, 1840 (GB).
- Sproule, John, editor. *The Irish Industrial Exhibition of 1853*.  
 Dublin: James McGlashan, 1854 (GB).
- "Statement of Claims of the British Subjects Interested in Opium  
 Surrendered to Captain Elliot at Canton for the Public Service."  
 London: Pelham, Richardson, 1840 (GB).
- "Statistical Information on Narcotic Drugs," Part Four,  
[www.incb.org](http://www.incb.org).

## BIBLIOGRAPHY

- "Substitutes for sulphate of Quinine," *Canton Register*, Tuesday, 25 October 1838, vol. 11, No. 39, (UM).
- Su, Lisa. "Unique experience to visit Opium War Museum in Humen town, Dongguan, Guangdong Province," dated 15 June 2007, [www.yangshuoholiday.com/travel-story/Humentown.htm](http://www.yangshuoholiday.com/travel-story/Humentown.htm).
- Szasz, Thomas. Our Right to Drugs: The Case for a Free Market. New York: Praeger, 1992.
- Pharmacracry: Medicine and Politics in America. Westport, CT: Praeger, 2001 (GB).
- Tamura, Eileen. China: Understanding its Past. Honolulu, HI: University of Hawaii Press, 1998 (GB).
- The Baptist Missionary Magazine*, vol. 20. Boston, MA: Board of Management of the Baptist General Convention, 1840 (GB).
- Thelwall, Algernon Sydney. The Iniquities of the Opium Trade with China. London: W. H. Allen and Co., 1839 (GB).
- "The opium trade - Medhurst's voyage in the American brig *Huron*," *Canton Register*, vol. 11, Thursday, 30 Oct 1838, no. 44.
- "The Narcotics we indulge in - Part II," *Blackwood's Edinburgh Magazine*. Vol. LXXIV. July-Dec 1853. Amercian edition - Vol. XXXVII. New York: Leonard Scott and Company, 1853 (GB).
- "The Price and Purity of Illicit Drugs: 1981 through the second quarter of 2003." Office of National Drug Control Policy Publication Number NCJ207768, November 2004, [www.briancbennett.com](http://www.briancbennett.com).
- The Republic of China Yearbook 1999. Taiwan: Republic of China Government Information Office, 1999.
- Thomson, Thomas. *Annals of Philosophy*. Vol. XIII. London: Baldwin, Cradock, and Joy, 1819 (GB).
- Tilgeman, Richard. "Decomposing Power of Water at High Temperatures," *The Civil Engineer and Architect's Journal* published in the *Scientific and Railway Gazette*. vol. XI. London: R. Groombridge and Sons, 1848 (GB).

## BIBLIOGRAPHY

- Tomlinson, Charles. The Natural History of Common Salt. London: Society for Promoting Christian Knowledge, 1850 (GB).
- Towns, C. B. Habits that Handicap. New York, NY: Arno Press, 1981 (GB).
- Train, George Francis. An American Merchant in Europe, Asia and Australia. New York: G. P. Putnam and Co., 1857 (GB).
- "Transforming Opium Poppies into Heroin,"  
[www.pbs.org/wgbh/pages/frontline/shows/heroin/transform](http://www.pbs.org/wgbh/pages/frontline/shows/heroin/transform).
- Trocki, Carl A. Opium, Empire and the Global Political Economy: A Study of the Asian Opium Trade 1750-1950. London: Routledge, 1999.
- Truchot, P. "On Errors arising from the Use of Bohemian Glass Vessels in Chemical Analysis, especially in Alkalimetry," *J. Chem. Soc.* 1875, 28: 381-385, [www.rsc.org/publishing/journals/article.asp?doi=js8752800381](http://www.rsc.org/publishing/journals/article.asp?doi=js8752800381).
- Twigger, Robert. "Inflation: The Value of the Pound 1750-1998." House of Commons Research Paper 99/20, 23 Feb 1999, [www.parliament.uk](http://www.parliament.uk).
- Twitchett, Denis and Fairbank, J. K., editors. The Cambridge History of Modern China, vol. 10. London: Cambridge University Press, 1978 (GB).
- Ure, Andrew. A Dictionary of Chemistry on the basis of Mr. Nicholson's. First American edition. Vol. I. Philadelphia, PA: Robert DeSilver, 1821 (GB).
- A Dictionary of Chemistry and Minerology. Fourth edition. London: Thomas Tegg, 1831 (GB).
- A Dictionary of Arts, Manufactures and Mines Containing a Clear Exposition of Their Principles. New York: D. Appleton and Co., 1854 (GB).
- A Dictionary of Arts, Manufactures, and Mines. Vol. II. New York: D. Appleton and Company, 1856 (GB).

## BIBLIOGRAPHY

- Viroy, J.J. "*De l'origine de la salsepareille rouge (fausse salsepareille)*," *Journal de Pharmacie*, eds. P.-J. Bouillon-Lagrange, et al. Vol. 11. Paris: Chez Louis Colas fils, 1825 (GB).
- Vogel. "*Expériences sur la Morphine et l'Acide Méconique*," *Journal de Pharmacie*. Vol. 3. Paris: Chez L. Colas, 1817 (GB).
- Waley, Arthur. The Opium War Through Chinese Eyes. Stanford, CA: Stanford University Press, 1968.
- Warren, Samuel. The Opium Question. London: James Ridgway, 1840 (GB).
- "War with China and the Opium Question," *Blackwood's Edinburgh Magazine*, vol. xlvii. Edinburgh: Wm. Blackwood and Sons, 1840 (GB).
- Wataru, Masuda. Japan and China: Mutual Representations in the Modern Era (trans. Joshua A. Fogel). New York: St. Martin's Press, 2000 (GB).
- Watt, James. "On a new Method of preparing a Test Liquor to Shew the Presence of Acids and Alkalies in Chemical Mixtures," The Annual Register, or a view of history, politics and Literature for the years 1784 and 1785. Second edition. London: Proprietors of Dodsley's Annual Register, et al., 1800 (GB).
- "Sequel to the thoughts on the constituent parts of water and dephlogisticated air," in a letter dated 30 April 1784 from Correspondence of the late James Watt. Muirhead, J. P., editor. London: John Murray, 1846 (GB).
- Watt, John and Charles, editors. *The Chemist, A Monthly Journal of Chemical Philosophy and of Chemistry Applied to the Arts, Manufactures, Agriculture, and Medica and Record of Pharmacy*. Vol. III, New Series. London: W. and T. Piper, 1851-1852 (GB).
- Watts, Henry. A Dictionary of Chemistry. Vol. I. London: Longman, Green, Longman, Roberts and Green, 1863 (GB).
- Weill, Paul B. "The Structure of Morphine," [www.poppies.org](http://www.poppies.org).



## BIBLIOGRAPHY

- Weinberg, B. A. and B. K. Bealer. The World of Caffeine. New York: Routledge, 2002 (GB).
- Williams, C. Greville. A Handbook of Chemical Manipulation. London: John Van Voorst, 1857 (GB).
- Williams, Samuel Wells. The Middle Kingdom. Vols. 1, 2. New York: Wiley and Putnam, 1848 (GB).
- Wilson, George. Chemistry. London: William and Robert Chambers, 1860 (GB).
- Wöhler. "On some principles of white cinnamon," *The Chemist, or Reporter of Chemical Discoveries and Improvement*, editors Charles and John Watt. Vol. V. London: Alexander Watt, 1844, (GB).
- Wolfe, Drew H. *Química - General, Organica y Biologica*. 2nd ed. Mexico, D.F.: McGraw-Hill, 1996, trans. Maria del Consuelo Hidalgo Mondragon (orig. Essentials of General, Organic and Biological Chemistry).
- Wong, J. Y. Deadly Dreams: Opium, Imperialism and the Arrow War. Cambridge, England: Cambridge University Press, 1998 (GB).
- Wong, Tak-yan. "Lime-making on TsingYi," from <http://sunzi1.lib.hku.hk/hkjo/view/44/4401562.pdf>.
- Wu, Debbie. "Tung Blossom Festival Kicks Off," *Taipei Times*, 20 April 2003, [www.taipeitimes.com](http://www.taipeitimes.com).
- Yang, Rui. The Third Delight: Internationalization of Higher Education in China. New York: Routledge, 2002 (GB).
- Zhongguo Fu Li Hui. "The Man Who Burned the Opium," *China Today*, 1990 (GB).

## INDEX

---

- Abeel, David, [126](#)
- Academie Royale de Medecine*, Derosne, [353](#)
- Acetic acid: method of Heumann, [338](#); Ma, [344](#); Sertuerner, [391](#); Liebig, [438](#); Merck, [442](#); sour, [612](#); weak, as lack of ionization, [620](#); vinegar on pH scale, [621](#)
- Acetic anhydride: and cocaine, [346](#); and heroin, [346](#)
- Acetone, and cocaine, [346](#)
- Acid: etymology from sour, [612](#); base extraction, reaction, [613](#); three theories of, [616](#); acid-base versus oxidation reaction, [619](#); indicators of, [622](#); acid-base extraction compared to distillation, [655](#)
- Aconitine, [350](#)
- Adams, John, on facts, [20](#)
- Aeneid*, [31](#), [192](#)
- Aerometer, of Baumé: [408](#); in grape juice, [409](#); in Robiquet, [430](#)
- Affinities, Theory of, [383](#)
- Age of the Alkaloids, [350](#)
- Ahen Fusetsugaki*, [41](#)
- Alcohol: distilled in China, [601](#); shamsuo, [207](#); distillation of, compared to acid-base extraction, [655](#)
- Alkali (*see specifically*, e.g., Ammonia), name broadly used, [421](#)
- Alkali-like, [351](#)
- Alkaloids: name, Meissner, [351](#); extraction, complex methods, [333](#); lack of purity, [375](#); as amines, [633](#); defined, [633](#); *raison d'être*, [634](#); of poppy family, [636](#); destruction of, compared to distillation of alcohol, [655](#)
- Amines: ammonia and morphine compared, [574](#); compared to ammonia, [628](#)–[629](#); classified, [629](#); base due to lone pair of electrons, [629](#); reaction with acids, [630](#); reaction with water, [631](#); phenolic, as morphine, [641](#)
- Ammonia: given off, method of Andre Barbier, [337](#); method of L. I. Brutko and L. M. Utkin, [341](#); method of Ma, [342](#); Séguin, [380](#); ease of separation, Séguin, [381](#); Sertuerner, [390](#) et seq; carbonate, Vogel, [394](#); in Wittstock, [440](#); Barbier, [337](#); Gregory, [448](#); thebaine, [460](#); catalyst in Solvay process, [523](#); on pH scale, [621](#); and amines, compared, [628](#); reaction with acids, [630](#); reaction with water, [631](#)
- Ammonium chloride: in S. E. Asian morphine extraction, [335](#); Heumann, [340](#); and cocaine, [346](#); Merck, [439](#); Pelletier, Thiboumery, Mohr, [444](#); Solvay process, [524](#); extraction and isolation of morphine, [641](#)
- Ammonium sulphate, in Kabay, [345](#)

## INDEX

- Amphoterism: [566](#); defined, [623](#)  
Amygdaline, [424](#)  
Anchetse, [115](#), [133](#)  
*Angelica polymorpha*, as opium cure, [601](#)  
Animal glue, [465-466](#)  
Annual, defined botanically, [194-195](#)  
Apothecaries' Hall of Ireland, [439](#)  
Aqua Tofana (Tophana), [438](#)  
Arago: with Gay Lussac on Robinet, [408](#)  
Archil (*see also* Tournsol, Litmus), [361](#)  
Archimedes, principle of in hydrometry, [410](#)  
*Areca catechu*, [473](#)  
Arrhenius, Svante: with Ostwald, ionic theory of acids and bases, [616](#)  
Anions, cations, [620](#)  
Arsenic, [472](#)  
Asparagine, [424](#)  
*Astible*, as Chinese opium cure, [601](#)  
*Atactylis ovata*, as Chinese opium cure, [601](#)  
*Atropa belladonna*, [462](#)  
Atropine, [462](#)  
Atung, one of Lin's translators, [485](#)  
Avicenna, Abu Ali al Husein Abdallah ibn Sina, [211](#)
- Bailing, hydrometer, [409](#)  
Bamboo, construction of towns, palisades, [534](#)  
Barbier, Andre, [336](#) et seq: sodium carbonate, [337](#); on Merck, [442](#);  
    substituting salt for ammonium chloride in recipe of Pelletier,  
    Thibouméry, Mohr, [445](#)  
Baryta: in Derosne, [359](#); in Séguin, [382](#) et seq; in Robiquet, [393](#); in Vogel,  
    [394](#); in Sertuerner, [394](#)  
Baumé: [409](#); aerometer, [409](#); inventor, [409](#); hydrometer, [409](#); [15](#) degrees  
    density, defined, [411](#)  
Benson, captain of the *Morrison*: [111](#), [118](#)  
Benzene: in method of Ma, [342](#); Kabay, [345](#); ring, [632](#)  
Berberine, [350](#)  
Betel: [472](#); betel pepper, [473](#); with kava, [474](#); as substitute for opium, [473](#)  
Bingham, First Lt.: refining process, [499](#); conserve, [500](#); saltmaking, [511](#);  
    burning shell to make lime, [519](#); silver, [174](#); observations on opium  
    smoking, [676](#)

## INDEX

- Biosphere II: [520](#)  
Bitter principle, [350](#)  
*Black Joke*, attack upon, [93](#)  
Bloch, Marc, 680n34  
Bohemian glass, [363](#)  
Boutron, with Robiquet on coffee, [468](#)  
Bradley, Dr., Siamese Dispensary, Bangkok, estimated addicts, [678](#)  
Brandes: [Manual of Chemistry](#), [497](#); atropine, [462](#); furnaces, [498](#)  
Bridgman, Elijah C.: opinion of the "destruction" of the opium, [15](#); editor, *Chinese Repository* at Zion's Corner, [103](#); witness, [117](#) et seq; prejudice against opium, [124](#); observes settling time, [118](#); silver and domestic poppies, [182](#)  
British General Chamber of Commerce, [51](#)  
Brix, hydrometer, [409](#)  
Bronsted, J. N.: with T. M. Lowry, proton theory of acids and bases, [617](#); compared to Lewis electron pair theory, [618](#)  
*Brucea antidysenterica*, [461](#)  
Brucine: Morson, [454](#); isolated, [461](#)  
"Burning of the Opium" as marble bas relief, [11](#)  
*Buzhengwan* (restorative tonics), recommended by Lin as opium cures, [602](#)
- Caffeine: [468](#); Robiquet and Boutron, [468](#)  
*Cañ*: with coca leaf, [472](#); *viva o muerta*, [476](#)  
Calcium carbonate (*see also* limestone): in S. E. Asian morphine extraction, [334](#); possibly in Derosne, [354](#); chalk, [449](#); marble, [449](#); quinine, [465](#); with coca leaf, [472](#); and acid rain on gargoyles, [515](#); stalagmites, [515](#); burned, kiln, [515](#); Solvay process, [523](#); TUMS, [614](#)  
Calcium chloride: Heumann, [339](#); Mohr, [444](#); Gregory and Robertson, [446](#) et seq; Robertson-Gregory process, [447](#); byproduct of Solvay process, [524](#)  
Calcium hydroxide (*see also* slaked lime): in S. E. Asian morphine extraction, [334](#); Heumann, [339](#); slaking, described in 19th century, [518](#); uses, [519](#)  
Calcium meconate: Heumann, [340](#); Gregory and Robertson, [452](#)  
Calcium morphenate: in S. E. Asian morphine extraction, [335](#); Heumann, [340](#)  
Calcium oxide (*see also* lime): in Southeast Asia morphine extraction, [334](#); from calcium carbonate, burned in kiln, [515](#); uses, [516](#); slaking, with Lin, [519](#); oyster shells, [519](#); with magnesium, [521](#); Solvay process, [524](#)  
Calcium sulfate, in sea salt, [513](#)  
*Camelles*, salt heaps, France, [513](#)

## INDEX

- Cantharadine, [424](#)  
*Canton Courier*, Chinese method of preparing opium, morphine, [482](#)  
*Canton Press*, laudatory article about Lin, [488](#)  
*Canton Register* (*see* Slade)  
Carbon dioxide (*see also* carbonic acid): Robinet and lime, [413](#); Biosphere II, [520](#); Solvay process, [523](#)  
Carr, E. H., [678](#)  
Cartier, hydrometer, [411](#)  
Cash, Chinese currency, compared to silver, [171](#)  
Catties and taels, [25n16](#)  
Caventou: with Pelletier and brucine, [461](#); with Pelletier and quinine, [464](#)  
Century eggs: [475](#)  
Chalk, (in Robertson), [449](#)  
Chandoo, [17](#)  
Chang Yo-sung, Acting Governor of Hupeh: [75](#); distillers, brokers, [497](#)  
Ch'ao-chou, shipment of opium from, [93](#)  
Chatham Square, statue of Lin in N.Y.: [13](#)  
Chaussier: narceine or codeic acid of Robinet, [417](#)  
Ch'en Ts'ang-ch'i, author of *Pen-ts'ao shih-i* (Supplementary herbalist), [193](#)  
Chien Pao-sheng, Governor of Hunan, [75](#)  
*Ch'ih*, [70n29](#)  
China, as "Patient Zero," [15](#)  
Chingopu, Governor of Shantung: [74](#); memorial on silver, [172](#)  
*Chin hwa tou* (Persian opium), [526](#)  
Choo Tsun, melters, [499](#)  
Chou Shu, Censor of the Kiangnan Circuit, on silver, [172](#)  
Chou T'ien-chueh, Director General of the Grain Transport, [75](#)  
Chuenpe (Chuenpee, Chuenpi, Chuanbi): King, [114](#), [116](#); Bridgman, [118](#); delivery, [135](#); storage, [136](#) et seq  
Chunhow (Chinkow): Bridgman, [117](#); argument over location, [134](#) et seq  
*Cinchona condaminea*, [463](#)  
*Cinchona cordifolia*, [464](#)  
Cinchonine: with Liebig, [438](#)  
Cinnamon: with Robinette, [403](#)  
Cloth rice sacks, used as filters in S. E. Asian morphine extraction, [335](#)  
Cochineal, with salt brines, Robinet, [418](#)  
Codeate of morphia (*see* Codiate of morphia)  
Codeic acid: named, [417](#); vs muriatic, [431-432](#)

## INDEX

- Codeine: with Heumann, [340](#); toluene and hydrochloric acid, [341](#); Ma, [343](#);  
percentage in opium, [458](#); with calcium chloride, [460](#); pharmacology,  
[459](#); methylation, [460](#)
- Codiate of morphia, dog experiments, [423](#)
- Colchicine, [350](#)
- Combat powder (*doumen san*), [193](#)
- Commonwealth Scientific and Industrial Research Organisation (CSIRO), [226](#)
- Concentrate of Poppy Straw, [228](#)
- Coniine, [350](#)
- Consoo hall meeting of 19 March 1839, [29](#)
- Construction of other tanks by Lin, [61](#)
- Copper sulfate, Tasmanian Alkaloids, [226](#)
- Courtois, Bernard: investigation of opium, [378](#); isolation of iodine, [379](#)
- Crabbe, benefits of opium, [676](#)
- Cresol, liquid saponated (lysol), [335](#)
- Crystallization: [367](#); defined, [627](#)
- Curarine, [350](#)
- 
- Das Morphiun*, Sertuerner, [391](#)
- Davis, John, translated by Lin, [487](#)
- Davy, Sir Humphrey, hydrogen theory of acids, [616](#)
- DEA 20026, pamphlet on S. E. Asian morphine extraction, [334](#)
- Dent, Arthur, [83](#), [85](#)
- Derosne, Jean-Francois: [353](#) et seq; *Memoire Sur l'Opium*, [358](#) et seq;  
contamination, [372-373](#); narcotine, [374](#); work known in Canton, [480](#)
- Diacetylmorphine (*see* Heroin)
- Dogs, experiments on: Derosne, [373](#); Sertuerner, [390](#)
- Dongguan Opium War Museum, [12](#)
- Double decomposition: Séguin, [385](#); defined, [625](#)
- Double elective affinity, [386](#)
- Dover's powder, [455](#)
- Dow process for magnesium ingots, [521](#) et seq
- Doyle, Sir Francis, English salt monopoly, [532](#)
- Dr. Hill, surgeon of the shipwrecked *Sunda* (*see* Hill, Dr.)
- Duboisia hopwoodii*, [474](#)
- Dumas, Alexandre, *père*, [362](#)

## INDEX

- Eighteen Rapids, Kan river, [490](#)  
Einbeck, north of Gottingen, [390](#)  
E. Leang, see I-liang  
Elliot, Charles, Superintendent: prediction of sale by Lin, [90](#); on silver, [174](#);  
devotion to principle, [651-652](#); with slavery and compensation, [652](#)  
Ellis, Reverend, view of Chinese probity, [658](#)  
Emetine: [350](#); with Morson, [454](#)  
*Erythroxylum coca*, [472](#)  
*Ex post facto*, unfair trial of Lin, [659](#)  
Extinction of slavery, British payment of twenty million, [15](#)
- Fertilizer, with lime, used in S. E. Asian morphine extraction, [335](#)  
Fetid mud, [112](#)  
Filters: cloth rice sacks, [335](#); vacuum, Heumann, [338](#); Buchner type, [338](#);  
wooden, [338](#); filtration as sifting, [587](#)  
Forbes, devotion to business, [652](#)  
Forerunners of Derosne, [353](#)  
Freeman, Derek, [673](#)  
French glass vessels, [363](#)  
Freud, cocaine as morphine and alcohol cure, [595](#)  
Frye, Northrup, [668](#)
- Gall nuts, and coffee, [468](#)  
*Gastrodia elata*, as opium cure, [601](#)  
Gay-Lussac: critique of continental chemists, [394-395](#); coining morphine,  
[400](#); paraphrased, [406](#); on Robinet, [408](#); hydrometer of, [411](#); volcanoes,  
[415](#)  
Ghazipur opium works, [526](#)  
Glauber: furnaces, salts, [497-498](#)  
GlaxoWellcome Australia Ltd., [227](#)  
Goat droppings, as cure for opium, [601](#)  
God of the Sea (*Chi Hai-shen wen*), [48](#)  
Goethe, and coffee, [468](#)  
Gomes, Dr., with cinchonine, [463](#)  
GoogleBookMites, [671](#)  
Gregory: and Robertson, [445](#) et seq; Gregory's salt, [446](#); codeine and calcium  
chloride, [446](#)  
Guibourt: work, [417](#)

## INDEX

- Gutzlaff, Karl: visits discouraged, [483](#); on salt production, [175](#); opium cures, [598](#); paraphrased, [658](#)
- Haiguo Tughi* (Illustrated Record of Maritime Nations), [488](#)
- Half-hour inspection tour, [129](#) et seq
- Henry: *Elements*, [355](#); quinine with Plisson, [464](#); proof of alkalinity of quinine, [467](#)
- He Qiuei, medical expert, [599](#)
- Heroin: Southeast Asia manufacture, [334](#) et seq; estimates of value imported, [592](#); Bayer company marketing as morphine cure, [595](#); name derived, [212](#)
- Hesiod, and derivation of morphine, [399](#)
- Heumann, W. R.: [337](#) et seq; lime and morphine, [340](#); sodium carbonate, [339](#); calcium hydroxide, [339](#); sodium hydroxide, [339](#)
- Heu-Naetse, the Vice-President of the Sacrificial Court, on melters, [498](#)
- Hew Kew, Sub-censor, Military Department, on wholesale brokers, [498](#)
- Hill, Dr.: surgeon of the shipwrecked *Sunda*, [40](#); interview with Lin, [485-488](#)
- Hof-Apotheke, and Sertuerner, [389](#)
- Hoffman, early investigator of opium, [353](#), [358](#), [379](#)
- Hofmann, degradation product, from nuciferine extracted from lotus, [190n21](#)
- Homer: and lotus, [190](#); and poppy, [191](#); and derivation of morphine, [399](#)
- Hour of the Snake, *ssu*, [134](#)
- House of Commons, estimate of inflation for British pound, [591-592](#)
- Howqua (Wu Bingjian): issues warning (according to Fay), [18](#); [52](#), [85](#)
- Hsuan-nan poetry club, with Lin and reformers, [486](#)
- Hsueh-ha t'an*, academy of Juan Yuan, [181](#)
- Hsu Nai-chi, on relegalization of opium, [181](#)
- Hua To, Chinese surgeon, use of poppy, [192](#)
- Hui*, blaze, destroy by fire: in first edict to the foreigners, [27](#); second letter to the queen (1840), [38](#); draft of second letter (1839), [39](#)
- Humen: salt ponds, [648](#); versus Chunhow as location, [649](#)
- Hwang Tseotsze (Huang Chueh-tzu), President of the Sacrificial Court: wholesale dealers, [498](#); memorial on silver, [173](#); describing plight of salt merchants, [176](#); as Huang Juezi, Han versus Manchu, [658](#)
- Hydrocarbon groups: replacing hydrogens in ammonia, [574](#), [628](#); benzene ring, [631](#)
- Hydrochloric acid: in S. E. Asian morphine extraction, [336](#); and cocaine, [346](#); other names for, [414](#); of hydrogen and chlorine, [414](#); and soda to



## INDEX

- make salt, [414](#); alchemical method, [414](#); soft clay, [414](#); volcanoes, [415](#);  
steam, [415](#); double decomposition, [416](#); with sulfuric acid, [416](#); oxides  
to chlorides, [416](#); muriatic vs codeic acid, [429](#) et seq; furnished by sea  
salt, [431](#); Wittstock, [440](#); Thibouméry, [444](#); Robertson, [449](#); on pH  
scale, [621](#); swimming pools, [622](#); with sodium carbonate, [625](#)
- Hydrogen: replaced by hydrocarbons in ammonia molecule, [574](#), [628](#); ion  
concentration and relative strength of acids, [616](#)
- Hydrometer: aerometer of Baumé, [409](#); of Bailing, Brix, Oechlé, Specific  
Gravity and Twaddle (Twaddell), [409](#); of, Cartier, Sykes, Gay-Lussac,  
and Tralles, [411](#)
- Hydroxide, ions versus hydrogen ions, [617](#)
- Hyoscyamine, [350](#)
- I-liang (E. Leang): governor, [101-102](#); signed off on memorial to emperor as to  
the process, [101](#)
- I-lü* (Charles Elliot), [38](#)
- India Gazette*, article "Opium, Narcotine, and Muriate of Narcotine," [480](#)
- Inglis, Robert, [85](#)
- International Anti-Narcotics Day, observed [26](#) June, [13](#)
- International Day against Drug Abuse and Illicit Trafficking, observed [26](#)  
June, [13](#)
- Interrogation of hong merchants, [52](#)
- Inspection tour, by foreigners, half-hour, [129](#) et seq
- Jardine, on relegalization, [181](#)
- Jetson, English trials of narcotine, [481](#)
- Jisuanu'an* (anti-acidic pills), recommended by Lin as opium cure, [602](#)
- Johns, *Animal Chemistry*, [404](#)
- Kabay, Janos: [224](#); process, [224-225](#)
- K'ai-pao pen-ts'ao* (The herbalist of the K'ai-pao period), [193](#), [213](#)
- Kairiku senbo roku*, [41](#)
- Kea-tsze, salt works, [175](#)
- Kerosene, and cocaine, [346](#)
- King, Charles W.: opinion of the "destruction" of the opium, [15](#), [112](#); reply to  
Lin, [30](#); *Olyphant and Company*, [30](#), [103](#); letter to Elliot, [31](#); letter to J.

## INDEX

- Ballestier, Esq., [113](#); witness, [112](#) et seq; conference with Lin, [115](#);  
prejudice regarding opium, [124](#)
- King, Charlotte, [119](#), [132](#)
- Knight's portable furnace, [497](#)
- Koshinga, Chinese pirate, [92](#)
- Kuan Ti, God of War, Lin burns incense, [137](#)
- Kueiliang, Governor of Honan: [75](#); on distillers, [496](#); memorial on silver, [172](#)
- Kung pan tou* (Patna opium), [526](#)
- Kung Tzu-chen, with Lin in poetry club, [486](#)
- Kurosawa, Akira, [132](#)
- Kwan, Admiral: discussion with Lin on shipping opium by sea, [91](#); heroics in  
dispatches and battle, [148-149](#)
- Lactic acid, in opium, [457](#)
- Lankit (Lankeet or Lung-hsueh) Island, [135](#), [138](#)
- Laudanine, [458](#)
- Laudanosine, [458](#)
- Lavoisier, Antoine: apparatus, [331-332](#); Séguin, pupil of, [184](#); oxygen theory  
of acids, [615](#)
- Lay, G. Tradescant, on cupidity of mandarins, [658](#)
- Lead acetate, Derosne, [360](#), [364](#)
- Leangchang Ken, Lt. General of the Province of Kwangse: brokers, [498](#);  
brokers and foreigners, friends, [506](#)
- LeBlanc process for sodium carbonate, [524](#)
- Lecithin diet, as cure for opium habit, [601](#)
- Lew, chief mandarin of the Nanhæ district: [81](#); depots for opium, [81-82](#)
- Lewis, Gilbert N., electron pair theory of acids and bases, [618](#)
- Li*, 70n29
- Lichens (*see also* Litmus, Archil, Orchil, Tournsol): Orcella, [361](#) et seq; orsine  
and variolarin isolated by Robiquet, [424](#); indicator, and others, [622](#)
- Liebig, Justus Van: with Merck, [438](#); morphine, strychnine, quinine and  
cinchonine, [438](#); and Gregory, [446](#); metals replace hydrogen theory of  
acids, [616](#)
- Lignum aloes*, as opium cure, [601](#)
- Lime (*see also* calcium oxide): Southeast Asia morphine extraction, with  
slaked lime (*see also* calcium hydroxide) and limestone (*see also* calcium  
carbonate), [334](#); and hydrochloric acid used in purification, [336](#); in  
accounts of Lin's process, [62](#) et seq; unslacked lime, in accounts of Lin's  
process, [65](#); lime powder, in accounts of Lin's process, [66](#); *zheng3 kuai4*

## INDEX

- tou4 shao1*, "whole pieces of thoroughly heated limes," 121; use of alleged, 113; and cocaine, 346; with Derosne, 359; in Séguin, 382 et seq; carbonate, 386; Sertuerner, 392; Robiquet, 394; Robinet, 413; Pelletier, 417; considered as an alkali, 421; Tilloy, 427; Merck, 439; Pelletier, Thibouméry, Mohr, 444; milk of, 444; Mohr, 444; Thibouméry, 444; with salt, Barbier, 445; meconate, 447; precipitations of compounds, 447; thebaine, 460; brucine, 462; atropine, 462; cinchonine, 463; quinine, 465; solanine, 467; caffeine, 468; Rhazes, 472; with coca leaf, 472; and betel, 473; and tobacco, 474; kava, 474; century eggs, 475; corn, 476; with purifiers, 494; with modern refinery, 500; Lin's *shi2 hui1*, 514 et seq; kiln, 515; derivations, Latin and English, 515; uses, 516; shellfish beds, Hong Kong, 516; slaking described, 19th century, 517; thermal burns, 518; and seawater for magnesium, 521; oyster shells, 521; in salt making to rid magnesium chloride, 521; in Solvay process, 522; estimates of the amount of lime used by Lin, 540 et seq; self-unloading pneumatic trucks, 540; pounds per cubic foot, 544; dissolving Lin's opium, 547; precipitation of morphine by, 562 et seq; limewater on pH scale, 621; in extraction and isolation of morphine, present recipe, 641
- Limestone (*see also* calcium carbonate): in S. E. Asian morphine extraction, 334; with quinine, 465; Notre Dame, 515; kilns, 515; iron ore, 516; burning in Solvay process, 524
- Ling Qing, great, great grandson of Lin Zexu, 12
- Lin Zexu (Lin Tse-hsü): Lin Zexu Memorial Hall, 12; dates of birth and death, 13n9; early examinations, 21; first administrative posts, 21; official title in Canton, 22; emperor's decree appointing Lin, 22-23; rarity of appointment, 24; memorial suggesting emperor burn opium in Peking, 40; death threat to Cohong, 84; inspection of trenches, 91; poem to sea spirit, 91; prejudice regarding opium, 124; and betel, 473; curiosity about West, 483 et seq; interpreters, 485 et seq; translation, 483 et seq; hernia, 484; Hsuan-nan poetry club, 486; arts and shifts, 486; interviews *Sunda* survivors, 486-488; knowledge of Indian opium tanks, 488-489; governor of Hu-Kwang, 490; on opium bowls, 490; gentle nature, 492; execution of petty thief, 492; consulted with dealers, 493; proposes death penalty for dealers, 495; as melter of opium, 499; pans, 501; particular manipulation of the opium, 502; folk tales about opium, 502; proposal to mint silver dollars, 529; resume, 530; exile to Ili, 530; luggage, 551; aqueduct, 539; visited by salt controller, 539; estimated salt and lime used, 538 et seq; *fait accompli*, 548; audiences with emperor, 549; transit time of dispatches,

## INDEX

- 550-551; time of journey from Peking to Canton, 551; estimate of foreign opium, 551; as needy scholar, 552; reimbursement with tea, 553; separation compared to Robinet's, 558; dissolving opium with salt or lime, 559; slaking lime, 572; carbonating pond, 570; substituting morphine for ammonia in Solvay process, 574; settling time, 574; option of substituting salt for ammonium chloride, 580; sedative salt, 585; proclamation on disposal of opium, 588; change of disposal of dregs, 589; size of job compared to European manufacturers, 529; asking Peter Parker for cures, 597-598; Chinese opium cures, 598 et seq; remedial directions and cures, 599-600; confiscation as cause of war, 645 et seq; kudos, 650; misjudgment of Elliot, 651-652; only honest man in China, 658; as Han versus Manchu, 658; judged unfairly *ex post facto*, 659; as Chinese Jesus, 666
- Li Shizhen, *Materia medica*, 213
- Lithium, Ma, as chloride, bromide, acetate, 344
- Li Ting, Introduction to Medicine, 213
- Litmus (*see also* Lichens, Tournsol, Archil, Orchil): 361 et seq; compared to other indicators, 622
- Liu Han, compiler of *K'ai-pao pen-ts'ao* (The herbalist of the K'ai-pao period), 213
- Lloyd's, a letter received noticing end of "destruction," 25 June 1839, 14
- Loo Taeyue, captain who escorts Bridgman and King, 103, 117, 132
- Lowry, T. M., with Bronsted, proton theory of acids and bases, 617
- Liquid saponated cresol (lysol), 335
- Madder, in salt brines, with Robinet, 418
- Magnesia: Robiquet on Sertuerner, 393, 425; Tilloy, 427
- Magnesium chloride: contaminant in salt making, 513; versus lime in salt making, 521
- Magnesium ingots, Dow process from seawater, 521
- Magnesium sulfate: in Robinet, 412; contaminant in sea salt, 513
- Mao, his choice of Lin Zexu as first modern anti-imperialist, 20n42
- Marble. in recipe of Robertson, 449
- Marine acid (*see* Hydrochloric acid)
- Matheson, James, prediction of non-destruction, 90
- Mead, Margaret, 673
- Meconic acid: Heumann, 339; results of Derosne, 374; Sertuerner, 390 et seq; disputed by Robinet, 417; chemical name, dicarboxylic 457
- Medelius (Wedelius), 353

## INDEX

- Meissner, Karl Frederick Wilhelm, and alkaloids, [351](#)
- Merck, H. E.: [438](#) et seq; Merck, Sharp and Dohme, [455](#)
- Metamorphoses*, [396](#), [398](#) (poem)
- Methanol, Ma, [342](#)
- Milk, investigations by Robinet, [403](#)
- Mixtamalization, [475](#)
- Mohr: with Pelletier and Thibouméry, [443](#) et seq; recipe, [444](#)
- Monument to the People's Heroes: [12](#)
- Morphai*, [397](#)
- Morpheus: Greek god of dreams, [396](#); Latin god of dreams, [396](#); son of Somnus, the god of sleep, [396](#); Greco-Roman, son of Hypnos (Somnus), the god of sleep, [397](#); Greek son of Somnus, the god of sleep, [397](#); Roman son of Somnus, the god of sleep, [397](#)
- Morphia, name used in English in 19th century, [401](#)
- Morphine: base, *pi-tzu*, [335](#); hydrochloride, [335](#) et seq; polybuffer separation, [341](#); first true drug, [352](#); results of Derosne, [374-375](#); *principium somniferum*, [389](#); with lime in Vogel [394](#); enters *Materia Medica* (1818), [395](#); Robinet's test for, [404](#); alkaline nature of, questioned, [405](#) et seq; separated by salt, Robinet, [408](#); salt of, described by Robinet, [411](#); tests blue, [412](#); solubility in lime, [413](#); Liebig, [438](#); Wittstock, [448](#); Barbier, on Merck, [442](#); muriate (Robertson), [448](#); Morson, [453](#); other manufacturers, [454](#); sales of, versus opium, [454-455](#); percentage of, in opium, [458](#); introduction to Chinese, plan by Murray, [480](#); known of in Canton, [480](#); produced in Canton in 1832, [482](#); substituted for ammonia in Solvay process, [574](#); settling out of solution, [576](#) et seq; hydrochloride using salt, [580](#); as opium cure, [595](#); in late 19th century cures for opium, [596](#); poppy cultivation measured in morphine equivalent, [199](#); God's own medicine, [212](#); main component of concentrate of poppy straw, [228](#); amphoteric, [623](#); as piperidine type amine, [628](#); as two molecules of tyrosine, [635](#); described, [637](#) et seq; as amphoteric pentacyclic, [637](#); monoacidic base, [638](#); as endorphin, [639](#); synthesis by Gates and Tschudi, [640](#); extraction and isolation explained, [641](#); as phenolic amine, [641](#)
- Morphine acid meconate, results of Derosne, [374](#)
- Morphium, das* [391](#) (Sertuerner); changed to morphine, [396](#) et seq
- Morson: and Robinet, [404](#); competitor using Gregory process, [454](#); morphine appears in London pharmacopeia (1836), [453](#); makes morphine acetate, emetine, strychnine and brucine, [454](#); son, T.N.R., [454](#)

## INDEX

- Muriate: of soda (sodium chloride), [414](#); of lime (calcium chloride), [416](#);  
double decomposition of steam and chloride, [415-416](#); of morphia, priced,  
Robertson, [449](#); of narcotine, article in *Canton Register*, [480](#)
- Muriatic acid (*see* Hydrochloric acid)
- Murray: introducing the Chinese to morphine, [480](#); translated by Lin,  
[484](#); morphine as more wholesome, [480](#); estimate of Chinese military,  
[646](#)
- Mustard, investigation by Robinet, [403](#)
- Napier, Lord: view of Chinese military strength, [646](#); after Napier affair,  
emperor's estimate of Chinese military capability, [646](#)
- Napolean, army, boot leather, Séguin, [377](#)
- Narceine (sedative salt of Robinet): and Chaussier, [417](#); combined with codeic  
acid, named by Pelletier, [417](#)
- Narcotine (Noscapine): in Heumann, [339](#); perhaps first true drug, [353](#); in  
results of Derosne, [374](#); isolated by Robiquet, [425](#); percentage in opium,  
[458](#); pharmacology, [458](#); article in *Canton Register* about, [480](#); English  
trials of, [481](#); recipe in *Canton Register*, [481](#)
- Nejayote*, [476](#)
- Neumann, early investigator of opium, [353](#)
- Nicotiana rustica*: [473](#)
- Nicotine: as example of alkaloid cure, [596](#); nicotine, ingested in another form,  
[644](#)
- Ni yu yingjili guowang xi* (a draft declaration to the sovereign of England), [35](#)
- Noscapine (*see* Narcotine)
- Notre Dame: built of limestone, [515](#)
- Oechlé, hydrometer, [409](#)
- Oil, and lime, 19th century account of Lin's process, [64](#)
- Oneiroi (Dreams), [398-399](#)
- Open jobsite, argument for, [99-100](#)
- Opium: "Opium burning pool," [12](#); consigned, not owned [29](#); first fifty chests  
received by Lin, [40](#); compared to manure, [87](#); delivered up or  
surrendered, [77](#) et seq; reusing burned, [96](#) et seq; burning marcs in  
boiler, [97](#); emperor's decree on, [88](#) et seq; change of language from *shao  
hui* to *xiao hui*, [89](#); change suggested by Teng Ying, [93](#); Southeast  
Asian, [334](#); Iranian, with Heumann, [337](#); Turkish, with Heumann, [338](#);  
polybuffer separation of, [341](#); alcohol, Derosne, [368](#); proportions to cold

## INDEX

water, Derosne, 358; separation by salt by Robinet, 408 et seq; versus sales of morphine, 454; used as remedy for, 455; composition, 457; salt of, article in *CR*, 482; as cure for itself, 595; cure at Ophthalmic Hospital, 597; dross, as cure for opium, 601 et seq; remedial drugs for, Lin, 601; medical prescriptions and remedial directions, 599; purifiers, salt and lime, 493; crude and prepared, 495; boiled, 495; distilleries, 496; brokers, 498; furnaces, 497; melters, 498; Lin as melter of, 499; refining, 499; refinery, film crew, 500; with Bingham's conserve, 500; pans, 501; Chinese method of, article in *CR*, 501; brokers friends with foreigners, 506; Lin's, 525 et seq; Ghazipur opium works, 526; Malwa versus Patna, 527; morphine content varies, 527; largest batch process separation of, 529; *lewah*, 535; size of chests packed in, 536; estimated dilution of Lin's solution, 547; Lin's crystallization, 544; substituted for ammonia in Solvay process, 574; estimates of value of foreign, 590 et seq; imports into China in 1830s, 591; House of Commons estimated value of, 591; domestic prohibition of causes increase in drain of silver, 171 et seq; domestic Chinese, 177; 1831 prohibition of, 178; five reasons for increase in foreign importation of, 179; foreign, seen as cause of silver drain, 180; relegalization proposed, 181; foreign speculation on relegalization of, 181; lack of good data on, 182; seized foreign, hectares needed to produce, 202; kilogram per hectare of, estimates, 202; etymology, 208 et seq; skeuomorphs indicating, 210; *theriaca*, 211; *opopanax*, 211; 19th century remedies containing, 212; fish-shaped pills, 213; golden elixir pills, 213; how used in India, England, 214; eating vs smoking mixed with tobacco, 214; *madak*, 215; smoking with tobacco vs smoking alone, 216; smoking vs eating, 217; harvesting by hand, 218 et seq; *nashtar* or *nurnee*, 219; harvesting unlike maple syrup, 220; shaving, 221; inspissation, 221; transshipment trade in during war, 651; morphed into common earth, 657; corruption engendered by drug war against, 656 et seq; proposed experiments with to disprove hypothesis, 661 et seq; modern bias against, 674 et seq ——— methods of destruction: *burned* in public, 16; *burned* on the beach, 16; *burned* at night, 17; sunk at sea, 17; thrown into sea, 18; ashes thrown into sea, 18; ships sail away with, 18; buried, 18; buried with quicklime, 18; plastered, 19; *burnt and destroyed* (Morrison), 25; *burned and destroyed* (Slade), 26; *publicly burned* (Shuck), 27; handed over for *destruction* (Waley), 28; *burnt* (Slade), 29; *to be burned* (King), 30; as on a funeral pile (King), 31; fake burnings, 32; *burned* (*shao*) by Lin (1838), 34; *committed to the flames, and consumed* (Morrison), 36; *cast into burning oil* (Waley), 36; foreign ships set on fire (Waley), 36;

## INDEX

- destroyed by fire* (Shuck, *hu*), 38; burned (*shao hu*) in Beijing, 40-41; lime and salt and water (Shuck), 38; incinerated (Japan), 41; burned (*shao hu*) according to the emperor, 43; *thrown to the bottom of the sea* (Waley), 45; plucked up the very root, 46; transformed by planting the five grains, 46; burned with wu-tung oil by Lin (1838), 47; thrown away into the rivers, 43; hurled to the depths (Waley), 48; mingled with the giant floods (Waley), 48; poured into the sea (*CR*), 48; thrown into the ocean (Chang), 48; *dregs be then cast into the sea* (Slade), 48; proposal to sail away with, 52; mixed with *unslaked lime and rock salt* (Slade), 57; with *lime and salt* (King), 58; salt and lime, 62 et seq; *sea-water ponds filled with lime* (Twitchett), 62; *lime and oil* (Bernard), 64; *nominally* (Gutzlaff), 65; *lime powder* (Chung), 66; *liquid made to flow through screens* (Chang), 70; dissolving and draining (Waley), 68; melting (Waley), 69; burned (*xiao hu*) with wutung oil (Chou T'ien-chueh), 75; burned (*shao hu*) with wutung oil by Lin (1838), 76; transmuted (*CR*), 86; dissolved (King), 86; from *shao hui* to *xiao hui* (emperor and Teng Ying), 89, 94; made into a fetid mud (King), 112  
Ophthalmic Hospital, Canton: 597; opium cure, 598; number of patients treated 1839, 677; ten reports on, estimated rate of Chinese addiction to opium, 677-678  
Orchil (*see also* Lichens, Archil, Tournsol, Litmus), 361  
Orfila, 423  
O'Shaughnessy, 480  
Ostwald, Wilhelm, with Arrhenius, ionic theory of acids and bases, 616  
Ovid, 397-398  
Oxalic acid: Derosne, 359  
Oxygen, lack of in Biosphere II, 520
- Paderborn, Prussia, 389  
Paissé (*see* Payssé)  
*Pak tou* (Malwa opium), 526  
Palmerston, Lord, on silver, 177  
*Pao-chia*, collective responsibility system, 179  
Pao Guoan, actor, 13  
Paohsing, General of Mukden, on silver, 184  
Papaverine: Heumann, 339, 340; polybuffer separation, 341; percentage in opium, 458; isolation by Merck, 461; pharmacology, 461  
*Papaver somniferum* L.: 186 et seq; Linnaeus, 186; opium poppy, oil poppy, opium farms, 187; etymology, 187; names for, 188; comparison to lotus,



## INDEX

- 189; ancient names for, 190; fossils and skeuomorphs of, 191; in Greek and Latin literature, 191-192; description, 194 et seq; related species, *P. alpinum*, *P. atlanticum*, 195; estimated number of species, 195; dehiscent, in the wild, 196; *P. setigerum*, *P. rhoeas*, *P. somniferum*, 197; seed oil, 197; other uses, 198; *Papaver rhoeas*, calnative, 198; estimates, licit and illicit cultivation of, 199; international cartel, 200; estimated cultivation, Ghazipur, 202; hectares needed to produce what Lin processed, 202; swidden agriculture for cultivation of, 204; soybean cakes, nightsoil used for fertilizer, 205; poppy tea, 206; shamsoo, 207; poppy straw, 228; Norman, 227; alkaloids extracted, 228
- Parker, Dr. Peter: 484; treating Lin for hernia, 484; asked by Lin for opium cures, 597; ten reports on Ophthalmic Hospital, estimated number of addicts, 677
- Payssé (Paissé), 358
- Pelletier: argues case for Séguin, 377; and Guibourt, 417 et seq; lime and Thibouméry, 417; pseudomorphine aka oxymorphine, oxydimorphine, dihydromorphine, or phormin, 417; with Thibouméry and Mohr, 443 et seq; brucine with Caventou, 461; quinine with Caventou, 464
- Pen-ts'ao shih-i* (Supplementary herbalist), 193
- Perennial, defined botanically, 195
- Phantasus, 397
- Pharmacracy, 645
- Phenol, 632
- Phenolphthalein, 622
- Phlogisticated nitrous acid, 364
- Phobetor (or Icelus), 397
- pH scale: 621; versus other indicators, 622
- Piperine, 350
- Piper methysticum*, 474
- Plisson: with Henry and quinine, 464; proof of alkalinity of quinine, 466
- Polybuffer separation, 341
- Potash (potassium carbonate): 351; and cocaine, 346; and Derosne, 353 et seq; precipitation, Derosne, 370 et seq; Séguin, 380 et seq; with codeine, 459
- Potassium: in Ma, as chloride, bromide, acetate, 344
- Potassium carbonate (*see* Potash)
- Precipitates: explained, 19th century, 360; precipitates, defined, 626
- Principium somniferum*, 389
- Proust, 353

## INDEX

- Pseudomorphine, aka oxymorphine, oxydimorphine, dihydromorphine, or phormin, [417](#) (see Pelletier with Guibourt)
- Pure Food and Drug Act, [596](#)
- Purifiers, [491](#) et seq
- Purpurine (Robiquet), [424](#)
- Queen of Heaven, sacrifice to, [137](#)
- Quicklime (*see* Lime), in accounts of Lin's process, [65](#)
- Quinidine, [350](#)
- Quinine: [463](#) et seq; narcotine substituted for, [481](#)
- Raffles, Sir Stamford: salt making in Java, interconnected tanks, [511](#); wrong on salt drying, [513](#)
- Rashomon, [132](#)
- Red cabbage juice, [622](#)
- Rees, John, letter to by Jardine, on relegalization of opium, [181](#)
- Rhazes, lime and opium as traditional remedy, [472](#)
- Rice sacks, cloth, used as filters in S. E. Asian morphine extraction, [335](#)
- Robertson: and Gregory, [445](#) et seq; improvement on Gregory's process, [448](#) et seq; muriate of lime, [450](#)
- Robinet, Stéphane: [403](#) et seq; phenolic nature of morphine unrecognized, [413](#); sedative salt of, [417](#); saline solutions, [407-408](#); ether, [411](#); solubility in lime, [413](#); experiments needed to confirm results, [422](#); results disputed by Robiquet, [431](#); method used in extraction of quinine, [465](#); 15% brine solution calculated, [540](#) et seq; saturation, [543](#); separation compared to Lin's, [556](#) et seq; lime on morphine, [564](#); carbon dioxide and lime, [570](#)
- Robiquet: [424](#) et seq; asked by Gay Lussac to confirm Sertuerner, [425](#); disputing results of Robinet, [431](#); caffeine with Boutron, [468](#); work known in Canton, [480](#); 7% salt brine, [542](#); saturation, [543](#); hydrochloric acid, [560](#); precipitation of morphine by magnesia, [563](#); settling of morphine, [576](#)
- Rohmer, Sax, [95](#)
- Roots, Dr., English trials of narcotine, [481](#)
- Runge, F. F.: with coffee, [468](#); possibly quinine, [468](#)

## INDEX

- Salt (*see also* sodium chloride): in accounts of Lin's process, [62](#) et seq; alleged, [113](#); Ma, [342](#) et seq; separation of opium, observed by Robinet, [407](#), et seq; more names, [414](#); saline solutions and Robinet, reported, [418](#); separation of opium phenomena, [419](#); in Wittstock process, [440](#); Barbier modification of the Pelletier-Thiboumery-Mohr method using, [445](#); in recipe for century eggs, [475](#); with purifiers, [494](#); Lin's, [507](#) et seq; 19th century production methods, [508](#); solution mining, [508](#); pans, ponds, [508](#); ponds, cascading, [509](#); brine pits, [510](#); Java, [511](#); sieve used in salt making, [512](#); sea, contaminants, [513](#); deliquescence of magnesium chloride, [513](#); and lime to rid magnesium, [521](#); purification by lime, [522](#); in Solvay process, [523](#); estimates for Lin's process, [539](#) et seq; weight in pounds per cubic foot, [541](#); fully saturated brine, [543](#); agitation necessary to dissolve, [557](#); separating Lin's opium, [557](#); settling tanks, [575](#); and silver, [175](#) et seq
- Salt (rock), in accounts of Lin's process, [65](#)
- Scheele, Carl Wilhelm, salt and lime, pre-Solvay, [525](#)
- Schoolchildren, anti-drug slogans, Humen, [14](#)
- Sea Spirit, poem to, by Lin, [91](#)
- Secret medical remedies (Robinet), [404](#)
- Séguin: as discoverer of morphine, [377](#) et seq; alkaline nature of morphine, [406](#); anticipating Robinet, [421](#); action of lime on morphine, [413](#)
- Se-kwan, western pass, pools built by Lin at, [61](#)
- Sertuerner, Frederick Wilhelm Adam Ferdinand: [389](#) et seq; ingenious idea, [406](#); action of lime on meconic acid, [392](#); work widely reported, [394](#)
- Shamsoo, [207](#)
- Shao*, burn, roast, or bake: in Lin's first memorial to the emperor, 1838, [34](#);
- Shao hui*, burn or burn down: in Lin's April 1839 memorial to the emperor, [40-41](#); in emperor's reply to privy council (1840), [42](#); in emperor's formal instructions to Lin, repeating Lin's formal suggestion, [89](#)
- Shuck, possibly known of by Lin, [488](#)
- Sifting, as filtration, [587](#)
- Silver: minted Chinese dollars, [312](#); drain of, as hypothesis for origin of the war, [171](#); rate of exchange with copper cash, [171](#); taxes paid in, [173](#); soldiers paid in, [174](#); drain of, as result of domestic prohibition of opium, [176](#); Silver War (1839-1842), [171](#); memorials on, [172](#) et seq; acknowledged as problem, [173](#); cause of problems with salt, [175](#); lack of good data, [182](#); other reasons for outflow, [183](#)
- Slade, John, editor *Canton Register*: emperor's edict appointing Lin, [22](#); Lin's first edict to foreigners, [26](#); reports meeting at Consol hall, [29](#); on

## INDEX

- impending bankruptcy of merchants, [30](#); translation of Lin's proclamation describing new method, [48](#); recipe for narcotine published at Canton, [481](#); on relegalization, [181](#)
- Slaked lime (*see also* calcium hydroxide): in S. E. Asian morphine extraction, [334](#); Heumann, [339](#)
- Slaking of lime, [517](#)
- Snow, C. P., two cultures, [668](#)
- Societe de Pharmacie*: Derosne, president of, [353](#); letter to, by Derosne, [354](#)
- Socrates, of Plato, that men do not desire known evils, [656](#)
- Soda ash (*see also* sodium carbonate): Séguin, [383](#)
- Sodium, in Ma, as bromide, chloride, acetate, [344](#)
- Sodium bisulphite, Kabay, [345](#)
- Sodium carbonate: method of Andre Barbier, [337](#); Heumann, [339](#); and cocaine, [346](#); and Merck, [442](#); Barbier's opinion, [443](#); glass, [516](#); solvay process for, [522](#); bicarbonate, [523](#); LeBlanc process for, [524](#)
- Sodium chloride (*see also* Salt): Ma, [343](#); Barbier's substitution of for ammonium chloride, [445](#); vs salt brine, *yan2 lu3*, [507](#); processes for obtaining, [508](#) et seq; natural crystallization, [509](#); contaminants in sea salt, [513](#)
- Sodium hydroxide: Heumann, [339](#); Ma, [343](#)
- Sodium meconate: observed by Pelletier and Guibourt, [420](#)
- Sodium sulfate, in sea salt, [513](#)
- Solanine, [467](#)
- Solanum dulcamara*, [467](#)
- Solanum tuberosum*, [467](#)
- Solvay, Ernst: Solvay-process powdered sodium carbonate, in method of Andre Barbier, [337](#); dates, [522](#); invention of process, [523](#); carbonating tower, [523](#); description of process, [523](#) et seq; patent, [524](#); his process versus LeBlanc, [524](#); process without ammonia, [525](#); versus century egg, [525](#)
- Sorensen, Soren Peter Lauritz, pH scale, [620](#)
- Southeast Asian heroin: morphine laboratory: [334](#); lime and morphine, [335](#); settling time, [335](#)
- Specific gravity: [410](#); scale in hydrometer, [410](#); definition, [410](#); water as standard, [410](#); weighing, [410](#); 15 degrees Baumé defined, [411](#)
- Spirit of salt (*see* Hydrochloric acid)
- Stalagmites, [515](#)
- Steam distillation, Heumann, [339](#)
- Stewart, Superintendent General of Vaccine, tests narcotine, [481](#)
- Strontia, in Séguin, [382](#) et seq

## INDEX

- Strychnine: [350](#); Morson, [454](#)  
Sublimation, [393](#)  
Su Ch'e, poem, poppies, [193](#)  
Sugar, in opium, [457](#)  
Sulfuric acid: in Derosne, [360](#); in Sertuerner, [392](#); in the making of hydrochloric acid, [416](#)  
*Sunda*, shipwrecked, [485](#) et seq  
Su Tung-p'o, Sung poet, [193](#)  
Sycee: domestic silver, [171](#); described by Gutzlaff, 171n1  
Sykes, hydrometer, [411](#)  
Szu-Tchhouan province, solution mining of salt, [508](#)
- Taels and catties, 25n16  
Ta-koo, salt heaps drying, [512](#)  
Taoukwang era, amount of drain of silver, [173](#)  
T'ao Yung, Tang poet, poppy flower, [193](#)  
Tasmanian Alkaloids Pty Ltd., [226](#)  
Teen-fe (Matsoo-poo), deity of Chinese seaman, [137](#)  
Teen-tsin, salt making, [512](#)  
Teng T'ing-chen (Tang): emperor's proclamation appointing Lin, [23](#);  
    crackdown and fake burnings, [32](#); warnings to foreigners, [52](#);  
    memorial to emperor on silver and opium, [172](#); distillers, brokers, [497](#);  
    opium cures, [599](#); effecting relegalization, [181](#); reports of corruption, [658](#)  
Teng Ying, censor Chekiang circuit: suggestion and change of language, *shao hui* to *xiao hui*, [93](#) et seq  
Thebaine: Heumann, [340](#); polybuffer separation, [341](#); isolation by Pelletier and Thibouméry, [417](#); percentage in opium, [458](#); used to make oxycodone and codeine, [460](#)  
Thelwall, Reverend A. S.: [125](#); translated by Lin, [484](#)  
Thenard, and Gay Lussac on hydrochloric acid, [415](#)  
Therapeutic state, [645](#)  
Thibouméry: manager of factory, [417](#); with Pelletier and Mohr, [443](#) et seq;  
    lime and morphine, [417](#)  
Thom, Mr., interpreter, [52](#)  
*Thomas Coutts*, Lin's second letter sent to England via, [40](#)  
*Tianran jieyanwan* (natural pills for breaking the opium habit), [603](#)  
Tienanmen Square, [12](#)  
Tilgemann, on steam and hydrochloric acid, [415](#)

## INDEX

- Tilloy: morphine from indigenous poppies of France, [223](#), [426](#); lime used to make morphine, [427](#)
- Tobacco: addiction cured with nicotine, [596](#); with betel as Lin's substitute for opium, [601](#); introduced into China, [214](#)
- Toluene, Ma, [342](#)
- Tournesol, tincture of (*see* Litmus): Derosne, [361](#) et seq
- Tralles (Trulles, Tralle): early investigator of opium, [358](#); hydrometer of, [411](#)
- Trichlorethylene, in method of Heumann, [339](#)
- Trommsdorff: *Trommsdorff's Journal der Pharmazie*, [389](#); with H. E. Merck, [438](#)
- Trotter: of E. I. Company, [487](#)
- Twaddle, his hydrometer, [411](#)
- Unslacked lime (*see* lime), [58](#)
- Vauquelin, on Séguin as discoverer of morphine, [379](#)
- Vattel, translated by Lin, [484](#)
- Veratrine, [350](#)
- Vesmann, coffee, [469](#)
- Vinegar, antidote to salt of Derosne, [373](#)
- Violets, tincture of: Derosne, [362](#) et seq; Séguin, [381](#); Derosne's test with potassium carbonate, [371](#)
- Vogel: confirming Sertuerner, with lime, [394](#)
- Wang Gui, physician, [194](#)
- Warner, captain of the *Thomas Coutts*, [40](#)
- Water: as standard in specific gravity, [410](#); Lin's aqueduct, [539](#)
- Watt, John and Charles, on Courtois as author of work of Séguin, [378](#)
- Wedelius (Medelius, Wedelin), [353](#)
- Wei Yuan: with Lin in poetry club, [486](#); collected Lin's works, [488](#)
- Wilberforce, benefits of opium, [676](#)
- Williams, C. Greville, sifting as filtration, [587](#)
- Wittstock: process using common salt, [440](#); compared to Gregory, [448](#)
- Wongchin, meets Bridgman at Zhenkou, [132](#)
- Wu Bingjian, [18](#), [52](#)
- Wu-hsiang* (black perfume), [214](#)

## INDEX

- Wu-tung oil: used in burning (*shao*) opium by Lin, [34](#); used in burning (*xiao hu*) opium by Chou T'ien-chueh, [75](#)  
*Wu-yen* (black smoke), [214](#)
- Xanthaline, [458](#)
- Xiao hui*, destroy (by burning or melting), used to mean burn, [75](#); change of language in emperor's instructions to Lin, [89](#); appears first in Teng Ying's memorial, [94](#)
- Yan Yin-kow, Commander of the Naval Cruisers, gives permission to the Americans to visit Zhenkou, [106](#)
- Yaou-kow*, distillery and name of broker, [496](#)
- Ya-p'ien* (opium), [38](#), [209](#)
- Ya-p'ien chan-cheng* (*The Opium War*), blockbuster movie, [13](#)
- Ya-p'ien Chan-cheng Tzu-liao Ts'ung-k'an* (Corpus of Material about the Opium War), [28](#)
- Ying-suh* (poppy): [188](#); *yingsu*, as poppy, Tang dynasty, [192](#); *yingsuke*, as poppy soup made from the capsules, Song dynasty, [193](#); *ying-hsiu*, as opium in the Philippines, [502](#)
- Yin-kwan*, barroom, [496](#)
- Yuan, Chen, patient not guilty of opium consumption, [216](#)
- Yuan, Juan, academy, supporters of relegalization, [181](#)
- Yuan Yu-lin: memorial by, on silver, [172](#)
- Yum-chae*, [485](#)
- Yuyao yuansfang* (Collection of prescriptions from the Imperial Medicine Bureau), [213](#)
- Zeal, and self-righteous pharmacratic presumption of drug haters, [682](#)







# DID LIN ZEXU MAKE MORPHINE?

## Volumes I/II

Lin Zexu arrives in Canton in March 1839, sent by the emperor of China to halt the opium trade. He demands the foreigners surrender their opium, threatens to burn it and holds them hostage for a month and a half. But Lin does not burn the opium. Instead, he constructs huge ponds and soaks

it in water, lime and salt. Most historians assume he destroyed it. Yet, at the same moment chemists in their laboratories in Paris, Berlin and Edinburgh were extracting morphine from opium using the same ingredients. Further, both the foreign traders and the Chinese wholesale dealers known as "melters" understood similar techniques of alkaloid extraction. Local pharmacies sold cures for the opium habit that contained opium, opium dross or morphine. Lin both knew and approved of these remedies. Could Lin Zexu have made morphine?

This controversial hypothesis challenges the myths about Lin Zexu, the First Opium War, China's modern history and the failed First World War on Drugs.

稟請繳收、全行燬化矣、  
箱、俱、由、該、國、領、事、義、律、  
鴉片、二、萬、二、百、八、十、三、

ISBN 978-09820787-2--3



9 780982 078723 >